THE ENGINEERING AND MINING JOURNAL.

VOL. XI.—NO. 10.—THIRD SERIES.] NEW YORK, TUESDAY, MARCH 7, 1871. [SINGLE COPIES 10 CENTS.

The Discovery of Actual Glaciers on the Pacific Slope.

By CLARENCE KING, U. S. Geologist.

WESTERN explorers have usually confined their labors to the more accessible altitudes; indeed it is only within the last ten years that the higher portions of the great West have been studied. One remarkable feature of the extreme elevations is the absence of glaciers. Wide areas of mountains whose average altitude and configuration are equivalent to the glacier-bearing mountains of Switzerland have been found to be covered here and there by deep fields of perpetual snow, similar in character to the *névé* of the Alps. The whole topography of the loftier Cordillera within the United States has been modified by glaciers now extinct: vast moraines flank the higher gorges; accumulations of gravels and sands, erratics, *roches montonnées*, and the finest possible instances of polished rock abound wherever a considerable mountain mass is lifted above nine thousand feet. It is almost startling to observe the freshness of these indications. Travel where one will in the high Sierras or in the more elevated regions of the Rocky Mountains, he seems to be treading the pathway of a glacier of yesterday. A future study will, without doubt, clear up the entire chronological relations of the ice occupation of these ranges. The studies of Professor WHITNEY and his corps in the heights of the Sierra Nevada have developed a series of extinct glaciers equaling in all respects the former grandeur of the Alpine system; yet, with the exception of one or two rudimentary masses of ice, nothing is left in the Sierras but the fields of perpetual *névé* snow. Very remarkable in depth and area as these are, they are not sufficiently extended, nor is there enough winter accumulation of snow to start a glacier movement. Singularly, too, the heights of Colorado prove to be even less snowy than the Sierras. The *névé* masses are less, and they waste much more during the dry season. The Wind River, Wahsatch and Uintah ranges have been examined by the writer, and although the extent of lofty peaks is very great, they are even less snowy than the heights of the Laramie range in Colorado. A comparison of the average annual temperatures of the Cordillera north of latitude 36° clearly shows that the climate is not too warm for the existence of glacier masses, and that the small precipitation of snow is due chiefly to the lack of moisture in the air. This entire region is swept by an almost invariable west wind, whose lower strata have been deprived of their moisture by the warm ascending currents of the valleys, and, although the peaks of the mountains are lifted into this wind, the actual amount of moisture is too small to create a great piling up of *névé*. Accordingly the summit region is characterized by the absence of glaciers and a tendency of the entire flora to ascend into higher altitudes than at corresponding Alpine stations. A single point lifted to a great height is not sufficient to form a great condenser. A widely elevated region is necessary for the creation of great local storm systems; the two parts of the Cordillera, therefore, where we should most naturally look for glaciers, are the Mount Whitney region, in the Sierras of California, and the high group west of Denver. Professor WHITNEY, in his description of the former, calls particular attention to their absence. The writer was one of those who made the exploration of this region, and was as much impressed as any one with this remarkable lack.

In early September, 1870, with a small detachment of "the U. S. Geological Exploration of the 40th Parallel," acting under the orders of Maj.-Gen. HUMPHREYS, I visited Mount Shasta, in northern California, for the purpose of making a detailed survey of the lava systems which flow eastward from that peak, and connect themselves with the basalt regions of the Nevada Desert. On September 11th, we climbed to the top of the lesser Shasta, a conical secondary crater jutting out from the main mass of the mountain on its northwest side. The party consisted of Mr. S. F. EMMONS, Mr. F. A. CLARK, Mr. A. B. CLARK, and Mr. SISSON, the well-known mountaineer and guide of the region, and the writer. We carried our physical and topographical instruments, our fur beds, and provisions for four days. In the afternoon at about half-past one o'clock, we reached the rim of the cone, and looked down into a deep gorge lying between the secondary crater and the main mass of Shasta, and saw directly beneath us a fine glacier, which started almost at the very crest of the main mountain, flowing toward us, and curving around the circular base of our cone. Its entire length in view was not less than three miles, its width opposite our station about four thousand feet, the surface here and there terribly broken in "cascades," and presenting all the characteristic features of similar glaciers elsewhere. The region of the terminal moraine was more extended than is usual in the Alps. The piles of rubbish superimposed upon the end of the ice indicated a much greater thickness of the glacier in former days. After finishing our observations upon the side crater, and spending a night upon the sharp edge of its rim, on the following morning we climbed over the divide to the main cone, and up to the extreme summit of Shasta, a point 14,440 feet above the sea level. From the crest I walked out to the northern edge of a prominent spur, and looked down upon the system of three considerable glaciers, the largest about four and a half miles in length, and two to three miles wide. On the next day we descended upon the *south* side of the cone, following the ordinary track by which earlier parties have made the climb. From the moment we left the summit we encountered less and less snow, and at no part of the journey were able to see a glacier. An east and west line divides the mountain into glacier-bearing and non-glacier-bearing halves. The ascent was formerly always made upon the south side, where, as stated, there are no glaciers, and this is why able scientific observers like Professor WHITNEY and his party should have scaled the mountain without discovering their existence.

Before and after the ascent of Mount Shasta, a week was given to an examination of the southern half of the volcano. Since the earliest settlement of Strawberry and Shasta valleys, there has never been such a complete denudation. From June to November, the snow masses were less than they have ever been seen before. This favored very greatly our geological observations, and gave us an excellent opportunity to study the relics of the former great *névé*. We explored one after another all the cañons which, approximately following the radius of the cone, are carved to a greater or less depth into the lava-flows. From the secondary cone around to the eastern side of the main mass are only occasional fields of snow and ice—bodies of a thousand or two feet long, usually quite narrow and lying on the more shaded sides of the ravines. In nature and texture they are quite similar to the true glacier ice, possessing in all cases planes of stratification which indicate the pressure of the formerly overlying masses. There is little doubt that all the scattered snowfields, that, in the months of August and September, dapple the southern slopes, are the relics of glaciers. They are found in the region of the ancient *névé*, but extending downward into what was formerly the zone of movement.

Upon reaching the eastern side we found in a deep cañon a considerable glacier, having its origin in a broad *névé* which reaches to the very summit of the peak. The entire angle of this glacier can be hardly less than 28°. It is one series of cascades, the whole front of the ice being crevassed in the most interesting manner. Near the lower end, divided by a boss of lava, it forks into two distinct bodies, one ending in an abrupt rounded face no less than nine hundred feet in height. Below this the other branch extends down the cañon for a mile and a half, covered throughout almost this entire length with loads of stones which are constantly falling in showers from the cañon walls on either side. Indeed, for a full mile the ice is only visible in occasional spots where cavities have been melted into its body and loads of stones have fallen in. From an archway under the end of a considerable stream flows out, milky, like the water of the Swiss glacier streams, with suspended sand. Following around the eastern base of Shasta, we made our camps near the upper region of vegetation, where the forest and perpetual snow touch each other. A third glacier of somewhat greater extent than the one just described, was found upon the northeast slope of the mountain, and upon the north slope, one of much greater dimensions. The exploration of this latter proved of very great interest in more ways than one. Receiving the snows of the entire north slope of the cone, it falls in a great field, covering the slope of the mountain for a breadth of about three or four miles, reaching down the cañons between four and five miles, its lower edge dividing into a number of lesser ice-streams which occupy the beds of the cañons. This mass is sufficiently large to partake of the convexity of the cone, and, judging from the depth of the cañons upon the south and southeast slopes of the mountain, the thickness cannot be less than from eighteen to twenty-five hundred feet. It is crevassed in a series of immense chasms, some of them two thousand feet long by thirty and even fifty feet wide. In one or two places the whole surface is broken with concentric systems of fissures, and these are invaded by a set of radial breaks which shatter the ice into a confusion of immense blocks. Snow bridges similar to those in the Swiss glaciers are the only means of crossing these chasms, and lend a spice of danger to the whole examination. The region of the terminal moraines is quite unlike that of the Alps, a larger portion of the glacier itself being covered by loads of angular débris. The whole north face of the mountain is one great body of ice, interrupted by a few sharp lava ridges which project above its general level. The veins of blue ice, the planes of stratification, were distinctly observed, but neither *moulins* nor regular dirt-bands are present. Numerous streams, however, flow over the surface of the ice, but they happen to pour into crevasses which are at present quite wide.

One of the most interesting of all the features of the country was, however, the clearly defined mornines of the ancient and more widely extended glacier system. Nearly all the whole topography of the lower part of the cone is modified by the deposition of glacial material. At an elevation of about eight thousand feet upon the southern or snowless side of the mountain, is a great plateau-like terrace, about twenty-five hundred or three thousand feet wide, extending around one-half of the cone and composed wholly of moraine material. Besides these, long, straight, or slightly curved medial moraines jut from the mountain in all directions, not unfrequently descending into the valley for several miles. Our party spent six weeks in climbing all over the cone, studying the systems of lava flows, laying down the sheets of material as they are exposed upon the flanks and cañons of the snowless parts of the mountain; and in making a detailed examination of the glaciers, and a complete survey of the cone and valleys about its base. A large number of altitudes were determined, and the material gotten by my assistant, Mr. F. A. CLARK, for a topographical map of the mountain and glaciers, on a scale of two inches to the mile, and with grade curves of two hundred feet vertical intervals. When this map is completed, and the accurate form and dimensions of the glaciers determined, it is my purpose to present a careful account of the past and present conditions of the great volcano. During the prosecution of this work, Mr. ARNOLD HAGUE, assistant in the survey, was engaged upon Mt. Hood, carrying out the same system of work, the topography being executed by Mr. A. D. WILSON. The system of volcanic flows, and the existing and extinct glacier of Hood, were worked out in the same manner as I have done for Shasta, and the results will form a part of our report. Later, Mr. S. F. EMMONS, accompanied also by Mr. WILSON, with very great difficulty pushed through the forest to Mt. Rainier, and laid the foundation of a similar survey of that cone. His descriptions of the peak and its glaciers will form a most interesting chapter of our work upon the volcanoes.

The following letter addressed to me by Mr. HAGUE contains an account of his glacier discoveries:

"CLARENCE KING, Esq., U. S. Geologist: Sir—During the past summer, under your instructions, I visited Mount Hood, in the Cascade range of Oregon, accompanied by Mr. A. D. WILSON, Topographer of the survey, for the purpose of examining the geological and lithological character of the extinct volcano, and also for preparing an accurate topographical map of the mountains and its vicinity, as far north as the Columbia river. The study of the peak, and its long gently-inclined lava ridges, was replete with important facts, and observations bearing upon the nature and laws that governed the volcanic outflows; but among the most interesting discoveries incident to the trip was the finding of existing glaciers upon the southern slope of the mountain. The summit of Mount Hood exposes upon the east, north, and on the northwest sides a bold, precipitous, jagged mass of rock, which forms the outer wall of the old crater, encircling it for three-fifths of the circumference. The remaining portion of the wall is wanting, the other two-fifths presenting a comparatively easy slope down to the timber-covered ridges below. The crater is nearly one-half a mile wide from east to west. The wall upon the inner side rises above the snow and ice filling the basin some 450 feet, while upon the outer side it falls off abruptly for 2,000 feet. This rim of the crater is very narrow; in many places the crest is not more than two feet wide. Three distinct glaciers have their origin in this basin, each the source of a stream of considerable size; the glaciers of the White, the Sandy, and the Little Sandy rivers. The White river glacier heads on the eastern side of the crater, and extends in a southeasterly direction. It is nearly a quarter of a mile wide at the head, and about two miles long, extending 500 feet below the line of timber-growth upon the sides of the mountain. Near the top of the crater a broad transverse crevasse cuts entirely across the glacier. Freshly fallen snow overhangs in projecting banks, the perpendicular walls of ice, making it exceedingly dangerous to approach. At one point only, the fissure may be crossed by an ice bridge. Further down the slope of the glacier transverse crevasses are of frequent occurrence, running nearly parallel with each other; most of them are, however, quite narrow. One broad chasm presented clean, sharply cut vertical sides, for nearly 200 feet in depth, of clear deep blue ice. Marginal crevasses, ice caves and caverns occur; many of the latter are very beautiful and afford fine opportunities for the study of the laminated and veined structure of glacial ice. Very many of the phenomena attendant upon glaciers elsewhere may be observed here. The terminal and lateral moraines are well marked and extensive. Medial moraines, however, do not appear, because the glacier has no tributaries. Glacial grooving, glacial débris and boulders are quite characteristic. The glacier of Sandy river is separated

from that of the White river, by a high bare ridge, standing boldly up above the ice and dividing the crater into two parts. The glacier descends to the southwest. It is fed by the snow and ice of a somewhat larger area of country, and is considerably broader than the glacier of White river. In length they are about equal. An immense amount of glacial débris must be annually carried down the stream, whose waters are heavily charged with fine light gray trachytic sand, brought down from above by this moving mass of ice. The character of the rock, a brittle, porous trachyte, is such, that under the wearing action of the glacier it would be easily eroded and ground to fine powder. The very extensive accumulations of sand-bank, which are constantly forming at the mouth of the stream, where it empties into the Columbia river, bear ample evidence of the fact. The Little Sandy river, a tributary of the main stream, with which it unites, a few miles below the base of the mountain, has its source in the third glacier, which is formed on the western flank of the peak, separated from the Sandy by a high wall, a somewhat broken, irregular ridge of trachyte, which extends along the southwest slope of the mountain. The upper portion of the *névé* of the glacier is inclined at quite a high angle, and is considerably fissured by broad deep crevasses. It has cut into the sides of the mountain a deep, narrow gorge with bare precipitous cliffs. The glacier and the valley of the Little Sandy are both quite narrrow. One of the most marked geological and topographical features of Mount Hood and the vicinity is its very extensive system of extinct glaciers, which everywhere gouged out immense trough-shaped valleys, cutting down deeply into the earlier trachytic lava flows of the old volcano. The entire network of valleys were all connected with two main glaciers; that of Hood river on the north, and the Sandy on the south. The ancient White river glacier was undoubtedly very large; but, as far as my observations have yet extended, had no tributaries.

Respectfully yours,

"ARNOLD HAGUE, Assistant Geologist.

"I propose, if my plans receive the sanction of my chief, General HUMPHREYS, to include Mt. Baker, Mt. St. Helens and Mt. Adams and probably San Francisco Mountain, in this series of monographic surveys; if so, at the close of next summer we shall be in possession of a complete series of maps and studies of all the great isolated volcanic cones of the Western United States."

Proposed Water Supply for Portions of Hudson, Essex and Union Counties, N. J.

Read before the Polytechnic Branch of the American Institute.

By SAMUEL D. TILLMAN, LL.D.

THE recent temporary failure in the supply of water to Jersey City and Hoboken naturally raises the query whether the present plans for obtaining water from the Passaic river will be adequate to the future wants of these rapidly expanding cities, and whether a more feasible method may be substituted. The extraordinary growth of New York is a significant indication of the vast population which, at no very distant day, must occupy the opposite shore of the Hudson river. Having maritime advantages precisely like those of New York, its facilities for inland trade and communication are far superior, since all the great West is at its back, and it already embraces the termini of nearly all the great western and southern lines of railway. Thus far the population has found room on the more elevated portions of the shore, but the time is rapidly approaching when all the low ground between the river and Newark will be required for manufacturing and business purposes. It is quite safe, therefore, to predict, that early in the next century the great American metropolis, which might properly be called Manhattan, will consist of NEW YORK, with its two millions, of BROOKLYN on one side with its million, and BERGEN on the other, embracing Jersey City, Hoboken, Weehawken, Bergen Point, Elizabeth and Newark, with its million of inhabitants.

On examining the best sources for supplying the water wants of the future BERGEN, one is first surprised to find within forty miles west of the Hudson river a lake whose surface is 914 feet above that of the river. The area of Lake Hopatcong is 2800 square acres, and its irregular contour on the map indicates that it nestles among mountains, and is the reservoir of an extensive water-shed. One of the great engineering feats of the future may be to bring the waters of this lake to the banks of the Hudson, with the whole pressure due to its height, less that required to overcome the friction of its passage through iron pipes. Of course, such a project would be feasible only in carrying out magnificent schemes of ornamentation and in furnishing artificial fountains of altitudes never before equalled. The remains of the water works of ancient Rome as described by travellers, excite our wonder. Its nine great aqueducts had a total length of 255 miles, and a capacity of daily discharge equal to fifty million cubic feet, yet the water was not conveyed at such height as to produce fountains of extraordinary altitude. The most remarkable ornamental fountains are of modern construction. At Versailles, France, a *jet d'eau* rises to the height of ninety feet, another at St. Cloud to 160 feet. The Peterkoff fountain in Russia is 120 feet, and the Chatsworth in England is said to be 267 feet high. The altitude of the Chatsworth reservoir being only 381 feet, the statement of the height of its water jet is too great, unless the water acquires a velocity near that due to its whole descent before reaching the discharging orifice.

It is generally supposed that the law illustrated by the inverted siphon is applicable to fountains, and that they would rise to the level of their respective reservoirs, were they not impeded by friction at the orifice and through the air; and, in the case of vertical jets, by the weight of the descending water. Early experiments seem to indicate that the height of jets rising from water under pressure, but almost motionless, are to each other at the square roots of the heights of their reservoirs. Taking an experiment in which a reservoir 133.4 feet high gave a jet of 100 feet as the standard, the Chatsworth fountain would have an altitude of 170 feet, while that from a reservoir 900 feet high would be 261 feet.

In turning to the most important question of supplying water for practical purposes to the residents of the great city, we find that the surplus waters of Lake Hopatcong, as well as those of Rockaway and Pompton rivers, are already monopolized by the Morris Canal and Banking Company for purposes of navigation; and the proposition now submitted is the feasibility of purchasing those waters from the company, or so amending its charter as to allow it to undertake the gigantic enterprise of supplying water to the territory alluded to for domestic uses, and to sell all its real estate not required for this purpose.

On examining the levels of the Morris Canal, it will be seen that the canal now approaches to within five miles of the city of Newark, at an elevation of 174 feet above the average level of the Passaic river at that place, and extends westward at the same elevation 17¼ miles; in the course of which it receives through the Pompton feeder the waters of Greenwood lake, which has about the same area as Lake Hapatcong. This long level may be made to serve the double purpose of an aqueduct and a reservoir, by widening the canal at numerous places where its waters are higher than the adjoining land. This great aqueduct, in its course from Lake Hopatcong, can be supplied with the pure waters of other mountain streams, and thus provide an ample and unfailing supply to a population of several million. From the terminus alluded to, water could be conveyed by means of its own pressure, in iron pipes, to the distributing reservoirs at Newark and Jersey City. These reservoirs are now supplied, by means of pumping-engines, from the Passaic river. Before reaching these engines, the river passes through Paterson and other manufacturing towns, receiving the drainage therefrom; and although it is admitted that water has the power of freeing itself to a certain extent from ordinary impurities, we must not overlook the fact that water is a solvent of a vast number of chemical compounds which cannot be eradicated by mechanical means.

As the proposed plan for the future water supply of places named cannot be carried into effect without the consent of the Morris Canal Company, the following considerations may have some influence in securing the favorable action of its stockholders:

1. The actual cost of the Morris Canal was over $5,000,000. It was purchased and repaired by the present reorganized company at an expense of about $3,400,000, the paid-up capital stock being $2,200,000. The business of the company has been faithfully and economically managed, yet its profits, after paying the interest on a debt of $1,150,000, only warranted, for the year 1869, a dividend of five per cent. on $1,175,000 of preferred stock, but no dividend on $1,025,000 of consolidated stock. The principal business of the canal has been the transportation of iron ore and mineral coal; and although the tonnage of iron ore has gradually increased, that of coal, during the years 1868-9, was about the same as for the year 1859, and only two-thirds of the whole amount of coal lately shipped has been carried to tide-water. This brief statement is sufficient to show that the Morris Canal Company is probably ready to entertain propositions which, if accepted, would give increased value to its stock.

2. If the Canal Company should consent to sell that portion of its real estate and water rights, which would be required in the construction of the proposed water works, its remaining lands and water rights east of the long level could be readily sold at their full value.

3. That portion of the Morris Canal within the limits of Jersey City, is now too valuable to be used for purposes of inland navigation. The city should purchase it, deepen it and connect it with a similar canal to be made towards the north and just below Bergen Hill, and use the whole for sewage purposes. It should be covered and converted into a grand highway in the same manner as was Canal street, in the city of New York.

4. That portion of the canal passing from Newark Bay through Bergen Hill might be sold to a company who would deepen it and carry it directly east into the Bay of New York, and thus make a short water communication for vessels of light draft between Newark and New York, thus obviating the necessity of passing southward around Bergen Point.

5. The last but most important consideration relates to the manner in which the Morris Canal Company may make the remaining proportion of their canal more efficient than at present. By its numerous inclined planes, boats are now carried to great heights with greater rapidity than by the use of locks alone. This plan is made feasible by constructing the boat in two sections, each about forty feet long and ten feet wide, which are separately elevated on railway trucks. As a novel and practical system of lifting and lowering vessels, these planes have elicited the approval of the best engineers of the world. The company may see fit to take a still bolder step by using the locks and planes west of Stanhope, for elevating boats 702 feet above the level of the Delaware, from which point they can be transferred to suitable trucks and carried, by the Morris and Essex or other railway, directly to tide-water. The descent of 842 feet greatly favoring their speed, the present number of boats would be increased in efficiency three or four-fold. Another feasible plan is to construct a railway on the towing path of the canal west of Stanhope, and use the inclined planes for elevating trains of cars loaded with coal, which could be moved from Stanhope east on the Morris and Essex railway.

In conclusion, a word should be said to the public interested, regarding the propriety of making so large an investment as the purchase of the Morris Canal water rights, although the amount required would be small, compared with the cost of the Croton and other aqueducts.

It may be doubted whether there is true economy in the course now generally adopted of making provisions to supply water only for a single generation, because when a rapid increase in population makes it quite apparent that additional supplies will soon be required, the sources of supply are found to be monopolized, or held at exhorbitant prices; and the same conditions occur in regard to the price of lands required for conduits and reservoirs. Just as Newark puts in operation her new pumping engines, Jersey City takes measures for the construction of another reservoir on land which has risen rapidly in value. New York is also moving in favor of increased water facilities, which will cost far more now than they would if secured at the outset. It is possible for New York to bring within her reach at the altitude of the Croton, a supply from a much larger water-shed than it now has; but the city of Brooklyn being higher than the general level of Long Island, will always be compelled to raise her supply by means of pumping engines; and however economical this method of filling reservoirs may be proved, it is certain a city thus supplied will never be prodigal in the use of water.

The residents of Hudson county, and the eastern portions of Essex and Union counties, will be most fortunate if they can secure the canal from near Newark to Lake Hopatcong, and the feeder connected with Lake Greenwood, thereby controlling water-courses having a total length of nearly 100 miles. Should the whole available area alluded to be covered with buildings, each would then have its full quota of water. From its abundance every vessel in the harbor could be supplied, and every stationary steam boiler be fed. It would find its way everywhere for the extinguishment of fires, and leap upward in the form of fountains to adorn parks, public gardens, and boulevards yet to be. We require but little foresight to prognosticate the future commercial greatness of Hudson county. Its eastern portion has been sadly marred by narrow and disjointed streets; being, in fact, a patch-work of villages, each of which was laid out to suit its own landowners. Although it is too late to provide broad and continuous avenues, which would have doubled the present value of city lots, the want of these may be more than counterbalanced by the introduction of water on such a grand scale as to secure for such lots superior sanitary advantages. The public authorities conferring this lasting benefit, will be duly honored by coming generations, who will point with pride to the magnificent water-works and gigantic *jets d'eau* of New Jersey.

The Relation Existing Between Chemistry and Mineralogy.

By Dr. C. RAMMELSBERG.

NOBODY doubts, now-a-days, that all the properties of a substance are very closely connected together; and since isomorphism was discovered to exist, some fifty years ago, every chemist knows that the crystalline form of a substance is intimately connected with the chemical nature of the body. The crystalline form is the result of a juxtaposition of molecules according to properly-defined symmetrical directions. That form defines, in the interior of the body, the directions according to which cleavage takes place, while differences of hardness, as well as other physical properties, depend also upon the specific crystalline form; while we need not doubt that the optical properties of the bodies are very closely allied to the form just alluded to, because we know that crystals possessed of one optical axis obey totally different laws of symmetery than do crystals having two optical axes; while it is also plain that crystals belonging to the regular system, in which we do not distinguish upper or under, front and back, left and right side, are on all sides symmetrical and singly refractive. Is not circular polarization bound to, and intimately connected with, the existence of peculiar forms of the crystals, on which we distinguish a difference of right and left? All agree that the thermal, electric and magnetic properties of bodies are connected with the geometrical figures they exhibit, while the volume-density (specific gravity) and specific heat of bodies are most intimately connected with the chemical nature and properties thereof. The perception that there exists of necessity a connection between all the properties of a body, and the fact that the sum total of the properties is required for determining the difference of that body from all others, is not of very remote date. It was for a great length of time the criterion of chemistry that it only occupied itself with the material nature and combinations of substances, while chemists only studied the composition and reaction of bodies, and cursorily added thereto some few particulars on color, fusing-point, boiling-point, and specific gravity. In our days, however, this is not deemed sufficient; and it is by far more important for the thorough building-up of science that a limited number of substances should be thoroughly studied and investigated in all their relations and all their properties, than that a very large number of bodies should be only imperfectly and fragmentarily known, involving the additional trouble of having to return to complete these studies afterwards. It is the especial duty of the chemist to study bodies in all their relations; and therefore, according to what is accepted as a rule, these properties embrace those termed geometrical, physical and chemical, and only after having mastered all these is it possible to say that we know the substance. It is, however, clear that it is beyond the limits of the ordinary capability of the human mind to master all the subjects thoroughly; while, moreover, not all the properties are of the same value, it having been found that by far the most important properties of substances are those termed chemical and geometrical, next to which stand the optical properties. Crystalline form and composition are therefore to be investigated in the first place, and jointly, because they are the foundation stone, as it were, of

the whole of the rest of the properties. A chemist ought to be just as expert in measuring and calculating the angles of crystals as he is capable of making analyses and of testing substances.

The late Dr. MITSCHERLICH became the discoverer of isomorphism and heteromorphism because he was a crystallographer, and M. PASTEUR would never have made his brilliant discoveries if he had not known that the rhombenoctahedron yields two enantiomorphous tetrahedrons. I think it is very desirable that our young chemists should become well acquainted with crystallography, which is too much neglected at present, so as to enable them to study the relations existing between chemical constitution and crystalline form. If it be alleged, against this proposition, that many other celebrated chemists, the late BERZELIUS, for instance, never gave any proof of his acquaintance with crystallography, my reply thereto is that, far from being any addition to, it rather was a defect of his merits; and, moreover, times have so changed that we may safely assert that, in the first place, universal chemists will be no more heard of, and, secondly, no sound knowledge of chemistry can exist without crystallographical knowledge combined. Mineralogy is truly a German science, which has sprung into existence from mining and metallurgical operations; for a long time this science was in a rude state, and bore an empirical character, only taking cognizance of a very few external properties, remaining in this condition even after WERNER's days. ROMÉ DE L'ISLE and HAUY discovered the mathematical laws of the crystalline forms, while the latter, very materially aided by VAUQUELIN, studied and investigated the physical properties of the crystals, which were chemically, also, analyzed by the last named *savant*. But the parties just named, and their successors—viz., MM. WEISS, MOHS, and many others—were only capable of studying minerals one-sidedly, because they were only crystallographers; and those on the other hand, who, preceded by KLAPROTH, investigated the chemical nature of minerals, were unacquainted with the methods of studying the geometrical properties of these bodies. This state of affairs has been at the root of an endless number of errors in mineralogy; because, what had been studied by one, and analyzed under the same name by the other, frequently turned out to be thoroughly different substances, and the division of labor has in this instance impeded and greatly impaired the progress of mineralogy.

What are minerals? Chemical combinations which, either sporadically or in large masses, constitute the solid structure of our globe. These compounds may, and can be artificially prepared, as in the case with all so-called artificial compounds; these compounds are formed without our aid, just as is the case with those formed in organized bodies.

Is there any difference between the crystals of sulphur deposited from solutions and those obtained from Sicily and from the Solfatara? Is the oxide of iron obtained from the fumaroles of the lava of the Vesuvius different from that which has been obtained in crystals artificially? Is the felspar obtained by some processes of copper smelting different from the native mineral? All these native compounds may be obtained synthetically by artificial means. The materials mineralogy has to deal with are limited to a small number of chemical combinations; the properties we mineralogists have to investigate and the methods of research are exactly identical with what obtains in chemistry. Nobody is, in the true meaning of the word, a mineralogist, unless he be equally capable of making a chemical analysis of his minerals as of determining crystals exactly. It was a curious blunder made by M. MOHS, when he tried to prove that minerals, like animals and plants, were only to be classified according to their external appearances, and that chemistry had nothing whatever to do with them. This opinion MOHS, a celebrated and very eminent crystallographer, was led to because he knew nothing whatever of chemistry, and because the discovery of isomorphism had remained unknown to him; his so-called natural history mineral system is perfect nonsense. But while we speak in these terms about MOHS, we are in justice bound equally to condemn the error of the late Dr. BERZELIUS, who tried to set up a purely chemical composition of the minerals. It is sufficient to say that heteromorphism alone is sufficient to prove the utter impossibility of such a proceeding.

We have at présent a so-called mixed system, that is to say, a more or less successful plan of grouping minerals in accordance with crystalline form and composition. Might it be allowed to call chemistry and mineralogy one science? It is very possible that, by so doing, many a so-called mineralogist, who knows naught about chemistry, might feel offended. Even if the distinctive name of mineralogy be preserved, it is clear that it will be entirely absorbed by chemistry, because the mutual relations of minerals towards each other, and their modes of formation and decomposition have long since become treated as separate sciences under the names of geognosy and geology. It was said, very many years ago, by the late Dr. BERZELIUS, "mineralogy is the chemistry of those compounds which are met with in the native state." The domain of chemistry is, however, far more extensive; but the properties we determine for every single substance are the same, and so are the methods and means we employ. Since the last quarter of a century, chemistry has made enormous progress, not only in the collection of a mass of facts, but also in speculative matters. It is self-evident that this progress has operated advantageously on mineralogy; and it is certainly the duty of all mineralogists to apply the facts and discoveries of chemistry, obtained and made in every direction, to their department of science. Some of the views formerly held by chemists have been entirely modified; but it is superfluous to say that the views held at the present day are simply due to the enormous and almost incredible increase of facts.

The following are only a few, yet essential, portions of the present magnificent structure of chemistry: The full recognition of the law of Avogadro; the sharply-drawn distinction between the idea of atoms and molecules; the doctrine of atomic weights; the quantivalence and equivalence of the elements; the analogy of the constitution of all acids, bases, and salts. I need not put the question whether there are at present living any chemists who yet hold the old views? Suffice it to say that no chemist of any standing would dare to defend these views; but, when chemists adopt certain views, theories, and hypotheses, because these better agree with facts, nobody also considers that these views are anything else than a step forward in the right direction, which in future may give way to better. That which the labor, zeal, and acumen of a large number of industrious scientific men has built up during the past twenty-five years must undoubtedly be designed *progress*. How is it that we meet here and there mineralogists who speak with disdain of these things, and who, declining to have anything to do therewith, stick to the old views, taking these new-fangled ideas as so much useless change? Just as in the domain of chemistry there is a predilection for cultivating and extending the organic portion, so in mineralogical science are geology and geognosy preferred; while, as regards the mineralogy proper, only a few cultivate it, and these are chiefly occupied with the morphological, not with the chemical portion. It is clear that these mineralogists will only apply to their purposes such researches of chemistry as directly relate to minerals; but they are incapable of understanding the real bearing of modern chemistry, and of making such changes in the science they cultivate as are rendered necessary by the progress of chemistry. The chief objection made is against the formulæ; these, as regards minerals, were, since they were first introduced by the late Dr. BERZELIUS, either empirical or rational. The former only indicate the kind and the relative number of the elementary atoms met with in the compound; and, as the old atomic weights are yet in use, the empirical formulæ are also those of older date. $CuFeS_2$ = copper pyrites, $CaSiO_3$ = wollastonite, $CAAlSi_2O_8$ = anorthite, $BaSO_4$ = heavy spar, are even yet the empirical formulæ of these bodies. It is evident that the changes made in many of the atomic weights has brought about considerable changes of formulæ: Fluor spar = $CaFl_2$ instead of CaFl, as formerly; leucite = $K_2AlSi_4O_{12}$, instead of $KAlSi_4O_{12}$; orthoclase = $K_2AlSi_6O_{16}$, instead of $KAlSi_6O_{16}$, &c.

As regards the rational formulæ, the matter is different, because they express a definite view as regards the mutual arrangements of the atoms in the molecule, as it was formerly surmised that the oxy-salts were the products of the addition of base and acid, the formulæ were arranged accordingly. $CaO+SiO_2$, $BaO+SO_3$, also—

$$(2CaO+SiO_2)+(_2AlO_3+3SiO_2) = \text{anorthite},$$

were the expressions at one time generally in use as the result of a hypothesis universally adopted in chemistry. This hypothesis has been set aside by chemists, not for the mere sake of change and novelty, but upon sound grounds; another hypothesis has been substituted, and according to it rational formulæ are now made up. Whether we write the formula of sulphate of baryta—

$$\left.\begin{matrix}Ba\\(SO_2)\end{matrix}\right\}O_2, \text{ or } Ba.O_2.(SO_2),$$

or any other way, we desire to express thereby that one molecule (two atoms) of oxygen is combined on the one hand with an atom of barium, and on the other hand with the atomic group SO_2 (the radical of sulphuric acid), exactly agreeing with the bodies—

$$\left.\begin{matrix}H_2\\(SO_2)\end{matrix}\right\}O_2 = H_2.O_2.(SO_2) \text{ and } \left.\begin{matrix}H_2\\Ba\end{matrix}\right\}O_2 = H_2O_2Ba;$$

that is to say, the acid and the base, by the reaction of which upon each other, and elimination of the equivalents, $H_2 = Ba$ or $H_2 = SO_2$ is produced. In the same manner, carbonate of lime is represented as—

$$\left.\begin{matrix}Ca\\(CO)\end{matrix}\right\}O_2 = Ca.O_2.(CO),$$

and silicate of lime as—

$$\left.\begin{matrix}Ca\\(SiO)\end{matrix}\right\}O_2 = Ca.O_2.(SiO_2).$$

Every one will admit that these views are distinct from those formerly held. Since chemists have adopted these methods of expression, heavy spar cannot be indicated as $BaO.SO_3$, wollastonite not as $CaO.SiO_2$, calc spar not as $CaO.CO_2$; because, whoever would apply these formulæ nowadays in mineralogy, ignores the present advanced state of chemistry altogether. We may say, however, that there is no fear that this will happen, because a mineralogist ought to understand enough of chemistry to know the grounds upon which the changes have been made by chemists. Now and then we hear it said by mineralogists that it is not yet proved whether silicic acid anhydride is SiO_2 or SiO_3, because the isomorphism of the double fluorides of Si, Ti, Zr, and Sn does not carry to them sufficient proof for SiO_2. How is it that they do not know that the formulæ, $SiCl_3$, $SiFl_3$, do not harmonize with the specific vapor-densities of these bodies? Are not the discoveries of silicide of hydrogen, and of those compounds of Si, H, and O which are analogous to organic compounds, proofs of the equivalence of carbon and silicium? No chemist of repute will, therefore, seriously use the formula SiO_3. Notwithstanding the ready adoption of new facts by many, it appears that it is very difficult for older men, and especially for mineralogists, to give up their old views; but, as well observed by Professor STRENG, they are, however reluctantly, compelled to follow and do suit and service to the new facts brought to light by the chemists.—*Chemical News.*

Steam Road Rolling.

WE notice, from the police reports, that Mr. RICHARD HARRIS, a barrister, supported by the Secretary of the Royal Society for the Prevention of Cruelty to Animals, has applied at Marlborough street for summonses against Mr. CHARLES LOWE, the assistant surveyor of Marylebone, and Mr. WILLIAM GREEN, foreman of the works, for causing cruelty to horses, it being stated, in making the application, that "the roadway extending from Regent's circus, Oxford street, to Margaret street, had been repaired with granite chips six inches in depth, and the surveyor, for some reason or other, had caused larger chips than usual to be placed in the roadway in a rough state, nothing being done to crush them, so as to enable horses to pass over the road with comfort." The magistrate, Mr. NEWTON, granted the summonses, and he remarked that he considered the case a very proper one to be tried. What the ultimate result of these summonses may be we do not know; but on passing down Regent street recently we noticed that the traffic between Oxford circus and Margaret street had been stopped, and that one of Messrs. AVELING & PORTER's steam road rollers was hard at work making a respectable road-way. Seeing that the parish authorities have taken prompt action in the matter (after the issue of the summonses) it is not unlikely that the prosecution may be abandoned, and so the case may remain untried. If, however, this or any other action of the kind proceeds, and it is proved that a charge of cruelty can be legally substantiated against so-called road makers who torture horses with spikes of broken granite, we hope that the Royal Society for the Prevention of Cruelty to Animals will take up the matter vigorously, and that by the aid of a few heavy fines, and perhaps a case or two of imprisonment, we may at length be able to get roads made and mended as they should be. If the amounts of common sense and common humanity with which parochial authorities are endowed by nature, are not sufficient to cause them to employ steam road rollers, the sooner an additional supply of these qualifications is furnished to them artificially by the aid of the strong arm of the law, the better.—*Engineering.*

Central American Sulphurets—Method of Manipulation in Guiana.

By ARTHUR COTHER, Mineral Assayer.

[Continued.]

HUNDREDS of square miles of pay dirt are lying unworked in Guiana. Wherever the almost impenetrable bush has been cleared away pay dirt has almost invariably presented itself, commencing at an average depth of four feet below the surface. The grains, or flakes, of sulphurated mineral, generally styled in mining parlance black sand, found under ground, is of a greater specific gravity than the free gold dust found in connection with it, consequently any attempt to separate the gold from the mineral, without the assistance of chemicals, is attended with partial failure, as only a small percentage of such gold will go to the bottom, and even that will not amalgamate in all cases. I have placed four or six dwts. of free gold, separated from arsenical pyrites, in an enamelled dish, with two or three dwts. of clean retorted quicksilver, shaking the contents of the dish, with and without water in it, endeavoring to cause the metal to enter into and amalgamate with the mercury, but without success. Metallic sodium, or sodium amalgam, greatly assists any such practical experiments, but I have found it fail in many instances, when used practically on a large scale. When mercury is used with the raw sulphurets a large percentage of it becomes granulated, absolutely floured. I have known ten pounds of quicksilver, out of 150 pounds used in the manipulation of one ton of quartz tailings, containing a very large quantity of the baser metals, to be absolutely lost, and it is generally taken for granted that where mercury is lost in gold amalgamation, a portion of the precious metal will be lost with it. This theory is not altogether correct, for mercury is liable to be floured on coming in contact with sulphides.

The silver mines of Guiana contain very rich ores, which are much more free from the baser metals than is the gold mineral, either placer or quartz. I think only one or two argentiferous lodes have been developed to any extent, although the surface rock assays, on the average, $150 to the ton, and can be treated very easily. Bromo-chloride being the principal combination to be broken up, the ore can be stripped of the metal within twenty per cent. by ordinary crushing with a Chilian mill in nearly a dry state, or rather in one of pulpy consistency; mercury is added when the ore is pulverized, and also sulphate of iron, which brings about the necessary chemical change, causing the metal to enter into and amalgamate with the quicksilver. With a steam jacket, underneath the bottom, to heat the mill, larger returns are obtained.

John Chinaman, with his primitive cradle, has taught us a lesson well worth knowing. He gives a high price for quartz tailings, works away quietly but steadily, and in a short time makes a little fortune. Now, surely if such is the case—and there is not a shadow of a doubt on the subject—science and economy combined can certainly achieve great results on a large scale.

Thousands of gold and silver manipulating machines have been patented within the last few years—one or two of which have been used in British Guiana—each new patentee claiming a precedence for his machine over that of any of his competitors. Mining speculators have encouraged these geniuses, spending almost fabulous sums of money to bring such machines into notice, and what is the result? Miners are now satisfied that minerals and ores containing rebellious metals cannot be successfully treated without chemical assistance. Sulphurets *must* be decomposed before the hidden treasure can be freed, ready for the process of amalgamation, and mechanical pulverization will not decompose sulphurets. Let the uninitiated try the following simple experiments: Pulverize one pound of auriferous black sand, using mercury and nitric acid—as I have frequently seen superintendents of quartz mills attempt to assay—the result, when washed off,

will be very little gold, if any, and a large loss of mercury. On the other hand, thoroughly roast the same pound of sand, pulverize in a mortar, using a little boiling water, mercury, and a small quantity of sodium amalgam—say 10 grains—wash off and compare notes of the two experiments, and the result will speak for itself.

Itacolumite (Articulite.)

THE attention of scientists has recently been again directed to the structure of this singular, flexible rock, by an article in the *Chemical News*, from the pen of Prof. A. M. EDWARDS. The labor of Prof. E., of which the article in question is a summary, was undertaken mainly to examine and confirm the results obtained in 1867 by Prof. C. M. WETHERILL, after a microscopic examination of the rock. The last named investigator determined the flexibility of the Itacolumite to be due to "small and innumerable ball and socket joints, which exist throughout the mass of the stone very uniformly," and proposed for it the name of "Articulite." Prof. EDWARDS examination resulted unfavorably to this view of the subject, and it is in reply to his paper, above referred to, that Prof. WETHERILL publishes another note on "Itacolumite," of which the following is an extract: In respect to the joints, it may be that

(1). Each ball and socket does not admit of a great play, and is not smooth and perfect like that of the joint of a limb; it is, notwithstanding, perfect in principle of motion. The stone is built up of grains and congeries of grains loosely coherent, and forming irregular cavities in which are engaged projecting parts of other congeries or grains of sand, which are susceptible of a slight motion in the cavity—in some cases in one direction, and in others in several or in all directions. This freedom of motion is of the true quality of a ball-and-socket joint.

(2). The motion is *not* most "marked in a direction at right angles to the lamination." It is certainly so if a piece be taken of which the thickness is small in proportion to the other dimensions; but that is not the method by which the true motion is shown. A properly made section is susceptible of as much motion in the plane of lamination as at right angles to such a plane.

(3). The proof of the nature of the joints does not rest solely upon the microscope, although that alone is sufficient. The motions of the cylindrical rod afford an independent and equally convincing demonstration of the ball-and-socket character. There is no other kind of joint which could explain the motions of which this rod is susceptible, viz: "It can be *compressed* and *elongated* in the direction of its axis, the extent of motion being a little over ½ m. m. When one end is fixed, the other end may describe a circle of 34 m. m. diameter, and may be made to *touch every point in the area of the approximate spherical zone.* The rod can also be *twisted about its axis*, the torsion being 10°. I may add that, by shaking the rod near the ear, one may hear the clicking of the joints as the motion is arrested at the limit of their greatest play.

The nature of the curve (nearly a catenary) when the rod is supported by its ends, agrees with the joints which I have described, and confirms also the revelations of the microscope. I have never seen anything so wonderful as this rod of itacolulite. When held by one end upward, it totters in all directions, so that no one, seing it at a short distance, believes that it is a stone. A gentleman from California, to whom it was shown, suggested jocularly that it would do well to build houses with in his earthquake shaken State. Indeed, I have no doubt that a sufficiently high and thin well built wall would be susceptible of a decided motion before cracking. The height of wall, so much greater than its thickness, would permit the play of the innumerable small joints, existing from the bottom to the top, to be perceived. In order to see the joints, a thin section, supported at one or both ends, may be moved while under the microscope with a needle point; by changing the position of the section, a part may be reached at which the play of the joints may be perceived. They can also be seen by *dissecting* a flexible piece of the mineral, using either a fragment or a surface rubbed flat. The surface to be examined is inverted, tapped, and, as far as practicable, brushed free from loose grains. It is then examined under the microscope with a power of 40 to 60 diameters.

The attention of the observer is first attracted by the irregular pits or depressions formed by grains of sand. By very delicate touches with a fine curved needle point, the surface may be investigated; loose grains of sand are seen and removed. Touching other grains and congeries of them delicately with the needle, proves that some have motion in a cavity formed of grains of sand and cemented together. These are dissected out, and other movable groups are found. Some have less motion than others, and some are immovable. By patient investigation of the mineral in this way, the observer will rise satisfied that it is made up of joints of the character which I have described.—*Journal of the Franklin Institute.*

A New Pyrometer.

IN a paper read before the French Academy, M. LIAMY describes a pyrometer of peculiar construction, a condensed description of which will be found below. The instrument is a practical application of the phenomenon first noticed and described, with numerous experiments, by M. SAINT-CLAIRE DEVILLE, and by him termed *Dissociation.* This phenomenon is simply that certain gaseous or volatile compounds, on being subjected to an increased temperature, are partially and progressively decomposed to an extent dependent upon the temperature, and, moreover, that the tension of the elements of the mixture; or, as its discoverer termed it, the tension of dissociation increases, but is constant with any given temperature. M. DEBRAY extended this fundamental law to solid substances, which consist of a fixed and a volatile constituent; as carbonate of lime. In this particular instance, the tension of dissociation can be exactly measured. Heated in vacuo to 860° (C), it decomposes itself to an extent that the maximum tension of the disengaged carbonic acid equals 85 mm.; heated to 1040°, the evolved gas acquires a pressure of 520 mm. Just as water evolves a vapor, which for a certain temperature possesses a constant or maximum tension, so also the carbonate of lime, only at a relatively much higher temperature, evolves carbonic acid until, for this temperature, enough is disengaged to exercise a certain constant or maximum tension; and as with water the tension of its vapor increases with the temperature, so also does the tension of dissociation of the carbonate; and, finally, as a decrease in temperature causes the partial condensation of the confined water vapor, so also does it bring about the partial absorption of the carbonic acid by the lime, so that soon the tension of dissociation, like that of aqueous vapor, will have fallen to a value which is constant for the altered temperature.

Upon this principle the simplicity and practical working of the lime pyrometer of M. LAMY will be readily comprehended. It consists of a porcelain tube glazed without and within, which is closed at one end, and attached at the other to a two-armed glass tube containing mercury, or to any other manometrical system. The porcelain tube is provided with powdered calcite or with pure marble, as far as it is exposed to the fire, and is then completely filled with carbonic acid by heating the marble to redness. When the tube returns again to its ordinary temperature, the carbonic acid will have been completely reabsorbed by the lime, and the manometer will indicate a vacuum. The chief advantages of this form of instrument are (by the author) stated to be its simplicity and the consequent cheapness of its construction, that it demands no calculation of its volume, and that it is not liable, at least during an operation, to get out of order. It can readily be attached to the majority of industrial furnaces, and the manometer can be attached at any desirable distance from the furnace. It is only necessary in practice to determine once for all the various maximum tensions of the gas corresponding to various temperatures.—*Journal of the Franklin Institute.*

MINING SUMMARY.

Canadian Mining Review, 1870.

From the Montreal Herald.

The progress of mining and allied industries of Canada during the year 1870 has been characterized by an almost total absence of speculation. Taking the whole Dominion into consideration, a steady advance may be said to have been made. Where there has been a falling off, it has been attributable to other causes than any failure in the mines themselves. The production of copper in the Province of Quebec has somewhat diminished; but, on the other hand, there has been an increase in that of silver, iron, salt, and petroleum in Ontario, and of coal in Nova Scotia. It has always been very difficult to obtain, in a short time after the close of the year, such information as we desire in regard to the production, etc., of our mines and minerals; but we are glad to notice that the Geological Survey began last year a systematic collection of the mineral statistics of the Dominion, and we are informed that the effort to obtain these data has been successful, and that as complete a statement as possible will shortly be published. In the meantime, we are indebted to Professor BELL, of the Survey, for notes on the progress of mining in the Provinces of Ontario and Quebec.

ONTARIO—COPPER.

The price of copper has fallen below that of 1869. In October, 1870, it touched the lowest point ever recorded, at least during the last 150 years. The cause of this has been due to the continuation of increased shipments from the west coast of South America (chiefly Chili and Bolivia), and also to the struggle between Germany and France. Messrs. J. PITCAIRN, CAMPBELL & Co., in their circular of 14th January, 1871, estimate the entire supply of the United Kingdom from all sources for 1870 at 78,480 tons of fine copper, against 73,505 tons in 1869. Of this Chili and Bolivia supplied 47,355 tons. The highest price for ores and regulus during the year was 13s. 6d. per unit in June and July, and the lowest 12s. in October. The average price of all the sales for the year, at the Swansea ticketings, was [according to Messrs. RICHARDSON & Co.'s circular] 12s. 8d. against 13s. 4d. in 1869, and the average percentage of the ores 15¼ against 13 15-16, in 1869. Messrs. JOHN TAYLOR & Sons, of London, have carried on operations at the West Canada mines [the old Bruce, Wellington and Huron Copper Bay locations] to about the same extent as in 1869, employing about 300 men and boys. These mines are now developed to such an extent that there is said to be ore for three or four years ahead in the workings ready for stoping out. About 2,000 tons of twenty-two per cent. ore were shipped during the year. The ores at this mine having always been dressed up to a high percentage for shipment to England, a good deal of copper was necessarily left in the tailings. These accumulations of many years are now to be treated by DE BOUSSEY'S wet process for the extraction of their copper. A stack 120 feet in height and four furnaces, with all the necessary appliances and buildings, have been erected at a cost, it is reported, of about $100,000. The reduction works are in charge of Mr. NINIS, and the process has been found to succeed elsewhere, and already, on a small scale, at this mine.

GOLD.

In the Hastings region, speculation has entirely died out, and the little work done during the year has been solely with a view to the legitimate profits of actual mining. The principal operations have been at the Cook mine, on lot seven in the ninth concession of Marmora, where a vein of arsenical pyrites of considerable regularity, and measuring four feet in thickness, has yielded an average of nine or ten dwts. of gold per ton. Visible gold is frequently met with in the mispickel of the present working, although none was seen at first, and the proprietors were encouraged to sink on the vein, owing to Professor CHAPMAN'S assays showing a notable proportion of the precious metal. In November last, 57 oz. 10 dwts. of smelted gold were produced at one "cleaning-up" from the crushing of 107¾ tons of ore. The whole produce of the year at this mine is said to have been 170 ounces. Towards the close of the year, operations are reported to have been resumed at the Phœnix mine in Madoc and at the Barrie mine in Elzevir.

SILVER.

Various accounts have recently been published in regard to the silver mine at Thunder Cape. The present writer visited the locality in the middle of last October, and has received accounts of the mine from Fort William up to the close of the year. The party sent by the new proprietors, under the direction of Captain F. B. FRUE, formerly of the South Pewabio mines, landed on the first September, and in two weeks had completed a coffer-dam eighty-two feet long, to shut out the water of the lake, and commenced mining. This dam was built of timber from the United States, and puddled with clay brought from the Detroit river. It was surrounded outside by a crib about 150 feet square, filled with stone. The water was quickly removed from the coffer-dam by means of steam-pumps. On the 16th of September the mine consisted of an open cut, about forty feet in length, along the out-crop of the vein, and only seven feet deep in the middle, tapering to nothing at each end. Out of this 120 barrels of ore had been taken by Captain FRUE'S men, in addition to what had been obtained by the Montreal Company, by working under water, and which yielded them upwards of $25,000. Several hundred weight of samples were deposited in Captain FRUE'S office, at Ryantown, on Thunder Cape. Some of these consisted of lumps of solid ore, as large as a man's head, from which the native silver protruded so thickly as to lacerate the fingers in attempting to lift them. At the time of my visit fifty-six men were employed, but only a few of them were miners. It was intended to increase the number, if possible, to 100 before winter set in. Up to the beginning of November the new company had landed 180 barrels of ore at the Sault Ste. Marie, from which it was being sent to Newark, N. J., to be reduced. The average weight of the barrels was 562 lbs., but one lot was larger and heavier. A further quantity of ore was sent down by the regular boats after the above date, and also by a steamer which was sent specially by the mining company, and which arrived at Thunder Cape on the 14th November. The bulk of the ore shipped by the Montreal company averaged a little over $2,000 to the ton, or about $1 per lb., and it was expected that what was sent away by the new company would prove equally rich. The first 100 barrels smelted, however, yielded only half that proportion, $1,000 per ton, and the whole amount raised at the beginning of December was about $80,000, but it was believed that the additional ore secured would bring the amount up to $130,000 early in January of the present year. Last autumn a vein which had been known for some time on the North shore of Thunder Bay, about twelve miles east of Current River, or opposite Mary's Island, was found to contain silver, and was soon afterwards bought by some Americans, represented by Captain BECK, who has been working the mine during the winter, and is said to have obtained good results. The Thunder Bay Silver Mining Company ceased operations in January, 1870. The buildings at the mine were all destroyed at the time of the great fires in the summer, but the stamp-mill and other buildings at the mouth of Current River escaped. A shaft was sunk on a silver vein, on McKellar's Island, last Winter, by parties at Fort William, but was not continued during the summer from want of funds.

IRON.

The Cobourg, Peterboro, and Marmora Railway and Mining Company have continued to work their iron mines in Belmont with great vigor. They employ over 100 men in the mines, and have spent a large sum in improving their railway. The shipments of ore for 1870 are reported to amount to about 10,000 tons. About 20,000 tons were produced in 1869. The Chaffer Mine, near Newboro', has been worked to a considerable extent during the past summer, and 3150 tons of ore have been sent by barges to Kingston and shipped thence to Cleveland, Ohio. The Matthews Mine, close to the last, has also been worked under the superintendence of Mr. FEFIELD, and 4570 tons of ore were sent off by the same route as that from the Chaffey Mine. About 50 tons of iron ore have been sent from Howe's lot in Belmont, but it is said that the distance which the ore requires to be hauled to Westpord, on the Rideau Canal, 14 miles, will prevent this deposit from being worked at present. The ore at all the above localities is of the magnetic variety, but at the "Cowan Mine," near Playfair's Mills, 12 miles west of Perth, a deposit of rich hematite has been worked by Messrs. COWAN, ROBINSON, D. TORRANCE & Co., and about 5000 tons of ore have been produced, of which about half has been shipped to Cleveland. This ore has been found to yield 60 per cent. of iron on the large scale. The extensive beds of iron ore on the east shore of Lake Superior, belonging to Mr. G. D. FERGUSSON, of Fergus, and others, remain unworked, but now that Canadian ores are coming so much into demand in the United States these deposits will doubtless receive attention.

LEAD.

The Galway Lead Mine, behind Peterboro, for some unknown cause has not been worked during the year. The last workings, over 100 feet in depth, showed the vein to improve greatly in going down. The Company are said to have several thousand dollars worth of galena on hand. Operations were suspended at the Frontinac Mine in July, owing to some disagreement among the proprietors. The main shaft had reached a depth of between 90 and 100 feet, with a greatly increased proportion of galena towards the bottom, the vein maintaining its general character, and a width of over ten feet. The westward continuation of the lode has been opened in a new place, about a mile from the main shaft, where it was found to be still rich in galena, and to have a thickness of 10½ feet.

PYRITES.

About 460 tons of this mineral were mined at the large deposit in the township of Elizabethtown, about three miles west of Brockville, for the use of the Brockville Chemical Works. In October last, 50 tons of pyrites were taken from a deposit on lot 20, in the 3d concession of the Township of Dalhousie, and shipped by way of Perth. The Lynn magnetic pyrites mine, belonging to Mr. JAMES BELL, of Perth, has not been worked during the year.

MINERAL PHOSPHATE.

Messrs. COWAN and ROBINSON have mined 400 tons of apatite in the Township of Burgess during the summer, and have sent it to their chemical works in Brockville, where 360 tons were converted into superphosphate of lime. This manure is worth $40 a ton at the works. The greater part was sent to the United States, where it commands a ready sale. A small quantity only was sold in Ontario and Quebeck, where its value is not yet sufficiently appreciated, and about 40 tons were sent to England. Two beds of apatite were opened by Mr. SAMUEL POOLE in the south-west corner of the Township of South Crosby last autumn, and 100 tons of the mineral taken out. Several gentlemen from England have visited the deposits of mineral phosphates in Elmsley, and other places in the neighborhood of Perth, and are said to have made arrangements for mining them extensively during the present year.

GYPSUM.

This mineral continues to be worked at various points along the

Grand River, all the way from Paris to Dunnville, but we have not the data for estimating the whole amount produced during the year. Mr. ALEXANDER TAYLOR raised about 3300 tons at York, and Mr. JOHN BROWN, of Thorold, about 1700 at the Grand River Plaster Beds, near Dunnville. This mineral, being obtained conveniently at many places in the Western States and in the Maritime Provinces, is sent across Lakes Erie and Ontario into Upper Canada and brought up the St. Lawrence to supply the Province of Quebec. In Montreal, 1500 tons of Nova Scotia plaster were ground last year by Mr. JOHN A. CONVERSE, and about 1000 tons by Messrs. LYMANS, CLARE & Co. There is also a plaster mill at Quebec, supplied with the raw material from the Lower Provinces.

SALT.

Brine was accidentally discovered at Goderich, in 1866, while boring a well in search of petroleum. Since that time a number of wells have been sunk, and the manufacture of salt has increased steadily, in spite of many difficulties. The average depth of the wells, ten of which are now in operation, is from 1000 to 1100 feet. Some of these wells penetrate solid rock salt, and the brine in all of them is of the purest kind, and of great strength. At first the evaporation was carried on by means of kettles only, but now pans are largely used, and found to be better adapted to the strong brine of the Goderich wells. Salt wells are also in operation at Clinton, Seaforth and Kincardine. Were it not for the enormous duty on salt imported into the United States, amounting to 24 cents per 100 lbs., if in packages, and 18 cents if in bulk, the salt business of Goderich would be very much greater than it is at the present time. Our own government, at the last session of the House of Commons, made a concession to the Canadian salt producers, by imposing a duty of 25 cents per barrel of 28) lbs. on salt imported from the United States. The effect of this has been a great reduction of the imports, and a corresponding increase in the home production. As nearly as we can determine, the latter has amounted to about 175,000 barrels for the year.

PETROLEUM.

The production of petroleum in the township of Enniskillen, Ont., has increased considerably, averaging during the first few months between 3000 and 4000 barrels per week, and towards the close of the year between 6000 and 7000 barrels, of 40 gallons each, so that the total production has probably been in the neighborhood of 250,000 barrels, or 10,000,000 of gallons. About one half of this has been exported. The exports of petroleum from the United States for 1870 have amounted to about 140,000,000 of gallons, exceeding in value the exports of flour. The price of crude oil at the Canadian wells has ranged from $1 25 to $2 25 per barrel, while that of refined has been about 20 cents per gallon. Much of the refining is done at London, from which town, according to the Inland Revenue Department, 1,°30,029 gallons were shipped during the year. The boring of new wells has been actively prosecuted. It would be impossible, in our limited space, to give the details of these operations; but their result has been to extend considerably the limits of the oil producing territory around Petrolia, and to show that as good wells are being struck now as at any period in the history of this region.

QUEBEC—COPPER.

The Huntingdon Mining Company has been recently reorganized on a large scale, and is under contract to supply 1000 tons of ore a month for the next two years. Work at the mine itself has been somewhat interrupted during the year, but about 4560 tons of ore have been produced. Part of this has been shipped to Swansea, and part to Baltimore, U. S. The company propose adopting Henderson's wet process for reducing some of their ore at the mine, which is situated in the Township of Bolton. The Hartford Mining and Smelting Company, whose works are a few miles west of Knoxville, have raised about 3000 tons of ore, and have a large quantity on hand. The sulphur of the ore is first used in the manufacture of acid, and the copper afterwards extracted. The ore has been sent to sulphuric acid works at Quebec, London, Ont., Boston, and Bridgeport, U. S. The Capel Mine, close to the last mentioned, has been worked during the whole year, with an average of 25 men. The ore is reduced to regulus, containing about 35 per cent. of copper, and shipped to Liverpool. This mine is now upwards of 300 feet deep. The proprietors are erecting apparatus for treating the ore by Messrs. HUNT and DOUGLASS' wet process. The Harvey Hill Mine, in Leeds, Megantic, belonging to the English and Canadian Mining Co., has given employment to an average of 25 men during the year. The work done has been more with a view to the development of the mine than to immediate production. The quantity sold amounted to only 132 tons of rich ore, which was sent to England, but about 500 tons of a lower grade remain on hand. At the Ives Mine, in Bolton, little has been done besides keeping the water pumped out of the workings.

GOLD.

In the Chaudiere region operations have been carried on only in the Seigniory of Rigaud-Vaudreuil, and there principally by the "Canadian and North-West Land and Mining Company," on property obtained from the DeLery Company. Mr. WM. P. LOCKWOOD, the agent of the new company, has had 20 or 30 men employed in alluvial digging, but proposes soon to commence crushing quartz from some of the auriferous veins on the property, and has obtained the use of the DeLery Company's mill for that purpose. Mr. LOCKWOOD's workings and explorations appear to have demonstrated the important fact, as pointed out by Mr. SELWYN, that the gold is not confined to the beds of the present streams, but belongs to a set of ancient water-courses, which do not correspond with the existing ones, but are concealed by the drift, sometimes crossing and running under the banks of the existing rivers. This discovery will enable explorations to be carried on more intelligibly, and with much greater probability of success than formerly. There appears to be little doubt that the gold of this district has been derived from the quartz veins in the immediate vicinity of the positions in which it is now found. The actual production in 1870 has been only some $15,000, against about $20,000 the previous year, but the yield is likely to be very much increased in future.

IRON.

The Hull Iron Mines, which had been closed for more than a year, were reopened in August last, and about 3,500 tons of 67 per cent. ore taken out before the end of the year. The property has been purchased by some of the parties who are interested in the Cobourg, Peterboro and Marmora Railway and Mining Company, under the name of the Forsyth Mining Company.

The St. Francis River Iron Works have been continued vigorously under the efficient management of Mr. O. A. RICHER. The ore reduced at these works is the variety known as limonite or bog-iron, which yields a very tough white metal, highly prized for the manufacture of car wheels, for which it is extensively used. About $20,000 worth of iron from the St. Francis forges was sold in Montreal during the year.

In the neighborhood of Three Rivers, Mr. A. LARUE's new works, north of the old Radnor forges, are said to have produced a large amount of iron, but we have no particulars to note. The St. Maurice forges, belonging to Messrs. JOHN MCDOUGAL & SONS, of Three Rivers, were partially suspended, owing to the removal of some of the works to a new locality further back in the country. Bog-ore is the variety reduced at both of these forges.

The original Moisie Iron Company is extinct, and the property having relapsed into the hands of Mr. W. M. MOLSON, a new company under the same name has been formed by a few parties in Montreal and Syracuse, N. Y., with a capital of $500,000.

SLATE.

The Rockland quarry, seven miles southeast of Melbourne village, has been worked during the whole year with an average of about thirty men. The depth of the quarry is now over eighty feet, and the quality of the slate continues to improve, and is considered equal to any in the world. The slates are dressed by small machines, which are found to be a great improvement on the old method of hand-dressing. At the Melbourne quarry, which is three or four miles south of the village of the same name, the steam-dressing machines have fallen into disuse, and the slates are again dressed by hand. About twenty-five men are employed. The company have been preparing the quarry for more extended and systematic working, so that the production of the year has not been equal to that of 1869. The united production of the two quarries will not exceed 5,000 squares for the year. Some of the old proprietors of Granby Red Slate quarry have paid off its liabilities, and are about to resume operations. The slate of this quarry has been found very suitable for the manufacture of jambs and mantels, and a considerable number were marbleized and sold in the Province a year or two ago.

The Danville School slate quarry has changed hands, and only a limited amount of work is being done. The slates from this quarry have been introduced into the market by Mr. ROBERT MILLER, of Montreal, and found to be well adapted for school purposes.

PEAT.

The largest business has been done by the Canada Peat Fuel Company. During the summer months they have employed at their three bogs at Lapigeoniere, St. Hubert and St. Brigide about 600 hands, and produced 16,000 tons of peat, worth $3 a ton on the ground. The peat is used by the Grand Trunk Railway, and is coming into favor for domestic use in Montreal. The Champlain bog, worked by Mr. R. GRAHAM, of Montreal, has supplied a largely increased quantity of fuel to the Montreal market. The Valleyfield Peat Coal Company, besides making extensive preparations for the manufacture of solid peat in the coming summer, produced and sold a quantity of fuel last season. Peat is worked to a small extent near Vaudreuil, St. Ours, Fern's Point and Riviere Ouelle. Almost inexhaustible supplies of this fuel exist in various parts of Quebec and the Maritime Provinces, and they will in future be turned to valuable account, when our forests shall have been exhausted. There is a peat bog in Anticosti, which is believed to have a greater area than the largest bog in Ireland.

NOVA SCOTIA.—COAL.

The returns for the past year have not yet come to hand. In 1869 the total quantity of coal raised, round and slack, in Nova Scotia (including Cape Breton) amounted to $501,794 tons. Of this quantity fully one half was shipped to the United States. It is understood that the total production of the collieries has been increased. The increase upon the Intercolonial, of Montreal, has been 12,000 tons, the export during the past year having reached over 72,000 tons. The developments and equipments of the mine are quite equal to an export of quadruple this quantity, if a market could be had for the coal. The slopes of the Acadia have been carried to a greater depth, and additonal working places provided. The facilities for raising large quantities of coal have been thus increased. The Albion, which is the *great* mine of the Province, has been singularly unfortunate during the past two years. The fire in the Ford pit was overcome, but caused a delay of four months. The great fire which broke out last year, on the rise of the main seam, still burns. The workings have been abandoned, but no active efforts have been made to extinguish the fire. The other pits afford facilities enough for raising all the coal required to supply present demands. No work of importance has been done upon any of the other coal areas, with the exception of following the Bain eight-feet seam into the Halliburton property adjoining.

CAPE BRETON.

The demand for the old Sydney coal still places the mine of that name at the head of the list. The Block House follows it, as a large quantity is used in New York for gas purposes. The Caledonia, Gowrie, Glace Bay, and Lingan run from 30,000 to 60,000 tons each. The Cape Breton collieries supplied three-fifths of the total production of the provinces. Springhill is likely to prove the most valuable coal field of any yet opened. One seam of 13 ft. 3 in. has been opened upon, while the outcrop of the 11 ft. 3 in. seam has been traced for more than three miles. The coal of this latter seam is of a remarkable quality, being almost free from sulphur, and containing only four *per cent.* of ash. The Intercolonial Railway will bring this into communication with the iron-ore beds of the Cobequid Mountains, and with Amherst, a convenient shipping port at the head of the Bay of Fundy.

GOLD.

There appears to have been a falling off in the total production during the past year. Sherbrooke district still ranks as the great producer, while Montagu has sprung from the eighth to the second place. Some large crushings from the Belt lode averaged over 17 ounces to the ton, and 1 ton 6 cwt. of quartz from the Sarah lode yielded 110 ounces refined gold. The fortunate owners of the Montagu Mines, it is reported, have cleared over $40,000 during the past year. The season altogether has been a dull one. No new discoveries of importance have been made, and it will evidently take a year or two longer before the mining interests can recover from the excessive speculations of 1867 and '68.

New Mexico.

THE GOLD FIELDS OF NORTHWESTERN NEW MEXICO AND SOUTHWESTERN COLORADO.

The Santa Fé *New Mexican*, Jan. 24, has the following account: "The party under Major FRENCH, which left this city last spring on a prospecting tour through the San Juan country, were more than usually successful. After prospecting all summer they found some very rich diggings about 50 miles west of La Loma, which they worked with encouraging results until the cold weather compelled them to leave. They however tested the diggings thoroughly, and are so well satisfied that in the spring operations will be resumed on an extensive scale. The Topeka *Commonwealth* has had a call from one of the party, Mr. EPHRAIM BAKER, who furnished the editor with the following account of the trip and discoveries made: 'Mr. BAKER, in company with Mr. WIGHTMAN, also of this city, and four others, making a party of six in all, started for New Mexico on the 4th of April last, to engage in mining in New Mexico. They reached Santa Fé without encountering any difficulties other than those incident to travel over land and camping out at night. Leaving there they started in a northwesterly direction, and struck the San Juan river about the first of July, and camped in the vicinity of a hot spring, the name of which was unknown to the party, but which Mr. BAKER says is one of peculiar medical virtues, and also that it will boil an egg in two minutes. While here they were discovered by a band of Ute Indians, who inquired their destination and object. Upon being informed that the party intended to mine in a district on the Dolores river, the band, through their chief, bade the party halt. They did not entirely give up the main object of their expedition, however, which was to hunt up some rich mining country, that would repay thom for all the troubles of the journey. Accordingly they doubled and twisted on their Indian friends until they found themselves in southwestern Colorado, about thirty-five miles south of the Rio Grande river, in the San Luis Valley, where they struck what will probably prove to be the richest mining districts in Colorado. They reached there the latter part of July, and immediately set to work, after satisfying themselves by the usual amount of "prospecting," that they had indeed been fortunate enough to discover gold, to preempt their claims under the law, and to organize themselves into a company. When this was done, they proceeded to get their sluices and other necessary paraphernalia for mining into shape. All this took time, and they only had about two weeks in which to work their mines before cold weather set in, and forced them to return to the haunts of civilization. During these two weeks, however, they "panned out" over four hundred dollars of the precious dust, a specimen of which was shown us by Mr. BAKER. It is an excellent quality, and is worth $18 per ounce. These mines are of an unusually rich character, as gold is found from the surface to the bed-rock, and will pay on an average of forty cents to the pan, while several nuggets as large as a bean were taken out by the party. There are nine lodes in this valley; the largest thirty-two feet wide. Block tin has also been discovered there. The whole party, including Mr. BAKER, who is now nearly sixty years of age, but robust and hearty as most men of thirty, will return to their mines in April. Mr. BAKER predicts that the whole valley will be filled with miners as soon as the spring opens, and not a spare claim will be left by the first of June.

Colorado.

The subject of the concentration of ores and the erection of smelting-works in the valley is, says the Georgetown *Miner*, attracting a great deal of attention in this portion of the hill country. Preparations are already made to commence work on a number of lodes that carry large quantities of ore, lean in silver and rich in lead, at an early day in the spring. The construction of a railway to the valley, in connection with the above subjects, is also engrossing public attention. The building for the Arey furnace, at the mill of the Stewart Silver Reducing Company, is about finished, and the brick work commenced. Work is to be pushed as rapidly as the weather will permit. The Montezuma lode, a new discovery in Virginia canon, is now being opened by a tunnel driven in on the vein. The ore from this mine assays over $100, coin, per ton.

A recent issue of the *Avalanche* has the following: "The Chariot mine is now yielding 100 tons of ore per day. They are now down about fifty feet in the seventh level, making the entire depth of the shaft 550 feet. It is intended to sink forty or fifty feet more, and then slope out the seventh level. The January account foots up $106,482 21, and $44,500 worth of Chariot bullion was shipped to San Francisco this week. The stock is active at advanced rates, selling on last Saturday at 81¼. There will undoubtedly be a handsome dividend declared this month. WELLS, FARGO & Co. shipped from here, this week, nineteen bars of Golden Chariot bullion, valued at $44,500."

Arizona.

FROM ARIZONA CITY.

We learn from the correspondence of the Tucson *Citizen* that the Cormorant Milling Company, near Gila City, have their extra battery nearly completed, and will re-commence work. The mining interest is steadily improving along the river. Large lot of ore on the levee for shipment to San Francisco.

FROM BRADSHAW DISTRICT.

The Prescott *Miner*, January 28th, says: "A party of miners and prospectors arrived in town Thursday afternoon, from Bradshaw district, with several sacks of ore from a recently-discovered silver ledge, which is said to be of immense size and richness. The Messrs. HEAD and HAMMOND, two of the party, informed us that rich gold ore was being taken out of the Del Pasco and other lodes. About twenty men were engaged in placer mining, making fair wages. In Hassayampa district, the Davis lode seems to be attracting no little attention. It is a large, well-defined lode, and assays largely in both gold and silver. The owners talk of trying a few tons of ore at the Chase mill. On Lynx Creek, Uncle BILLY POINTER and C. Y. SHELTON are pursuing work on their lodes with results quite flattering. We hear that SHELTON is negotiating for the purchase of the Eureka mill. The Big Bug mill is running on good ore. The Eugenie pays regularly. The Vulture mill is running as usual, and the aspect of mining matters is bright."

Idaho.

SNAKE RIVER.

A correspondent of the *Statesman* writing from the Snake River Mines, January 21, says:—According to the number engaged in the business of mining on Snake river, they have done as well during the past summer as the miners in any other part of the Pacific slope, The gold found here is of a very fine quality, and is called flour gold, The only profitable method of working these mines is by the rocker with copper plate, reminding one of "forty-nine" as he sees them strung along the river. Heretofore the Chinese were prohibited from mining in this district; but last fall that provision was repealed. This district, which is called Black Sand District No. 2, is about fourteen miles in extent, and will pay from five to eight dollars per day to the hand. The Chinese, as a class, are better adapted to this sort of mining, and there is room here for five hundred of them. There, fore, let them come. They can work in peace. We have had a very pleasant winter, thus far, with but little snow. The miners here have been engaged the principal part of the time in blasting and clearing away the rocks, and some have been working on the north side of Snake river.

MARKET REVIEW.

The Coal Trade.

NEW YORK, March 3, 1871.

WHOLESALE.—In consequence of the strike in the various Coal Regions, and the embargo of the Railroad Companies, there is little or no coal coming to tide-water. What business is transacted is in odd lots, floating around the market and at speculative prices. The first excitement of the "war upon labor" has died away. The city papers have generally exhausted themselves in the "nine days' wonder," and got all the profit possible out of this "always popular question." Dealers and consumers are becoming calm and composed, and are now in all probability ready to take a sensible view of matters. Our readers must have been salivated during the past two weeks with the voluminous reports in the papers, and generally disgusted with the ignorance displayed on coal affairs by the daily press.

The coal trade has so many ramifications, and each so closely intertwined with the other, that it is a difficult matter for an editor who only casually takes up the subject, to comprehend it thoroughly in so short a time as is generally given to the preparation of "leaders." In fact, experience has taught us that nothing short of actual and continual connection with the coal trade, makes an editor capable of that duty. It can hardly be expected that a party writing on the San Domingo question one day, tariff the next, on local questions the third day, and so on, can suddenly take up an intricate question like the coal trade, for which, unlike many other trade questions, sufficient data cannot be obtained from libraries, nor conclusions drawn from the past; and each and every one of the various disturbances in the coal regions has its peculiar feature, in which it is without precedent.

The present strike, for instance, is the first upon record in which the transportation companies have combined with the operators and owners of the mines. Heretofore this has been the weakest and most vulnerable point of the operators in opposing strikes. Some operator, who had suddenly become sick of his bargain with the rest, "to keep a bold front and fight the thing out," would yield to the miners, and start his colliery; and the fact of his sending his product to market and getting a big price for it, in the midst of the strike, would break the backbone of the combination. But the adoption of prohibitory tolls by the railroad companies practically forbids any such transaction at the present time, and holds the operators together as a unit.

Another singular point in regard to the strike is that, notwithstanding the bitter war existing between the miners and laborers and the operators, assisted by the railroad companies, no feelings of hatred or deeds of violence have thus far resulted, the indications of the daily papers to the contrary, notwithstanding. The interests of both parties are largely identical; and the inauguration of the present strike was as necessary to the one as to the other. In consequence of an over-production (as might be the case in any other branch of industry), the price of coal was too low to pay high wages to the miner and laborer, and to allow a reasonable profit to the operator and dealer. Nothing but a stoppage could correct the evil, and there is no doubt that it was mutually agreed upon by the "powers that be." It was not intended, however, that the strike should be of so long duration; and, indeed, this would not have been the case had not a side-issue been lugged in. Namely, the operator has concluded that the miners and laborers shall no longer control the investment of his capital. The strength of 30,000 miners and laborers, thoroughly organized in a union, is such that they believe themselves able to fight on this side-issue, and, in fact, turn it into the principal issue of the struggle; and, although it is hard for $500,000,000 capital to be governed by 30,000 miners and laborers, who do not own it, it looks very much as if labor would succeed.

Our reasons for this impression are the following. The miners and laborers have in their treasury probably sufficient funds to keep them from want for some time to come. They have the sympathy of the other trades-unions in the country, which are ready to assist them with funds if necessary; and, in addition to this, they have the aid of local politicians in their several districts, who ask their suffrages, and who are no doubt willing to pay for them in money and encouragement. Moreover, the spring is at hand; new fields of labor will be opened to many of them in farming, road-building, house-building, and other odd jobs; and last, though not least, the greater portion of the strikers can emigrate for the time being, and seeking employment in other branches of industry in neighboring cities, leave their homes and families, and the strike virtually in force.

On the other side of the picture, the operators and Transportation Companies are under immense expenditures. Take, for instance, the Delaware, Lackawanna and Western Railroad Co., which mines and transports its own coal. First, it has a capital of $60,000,000 upon which interest must be paid; secondly, all the rolling stock and usual transportation facilities designed specially for coal must be kept in order; thirdly, a host of engineers, firemen, car-tenders, workmen, officers, clerks, etc., must be retained. In addition to all this, there are heavy expenditures to be met at the coal-mines. In short, the total present monthly expenses of this company is estimated to be some $600,000; that of the Delaware and Hudson Canal Company, some $250,000; that of the Pennsylvania Coal Company, some $150,000, and so on, down to the mine-owner who runs a single colliery, whose estimated expense, during the strike, is $8,000 to $10,000 per month. Our readers may now, perhaps, be able to judge which party holds the strongest position, and which will ultimately be victorious.

As we have remarked in previous articles, the fight will be a long one. The miners and laborers, knowing their strength and confident of success, will not surrender. The capitalists, proud as well as desperate, will stubbornly contend every inch of ground. The whole matter will in all probability end in a compromise of some kind, in which the "dignity" of neither side will be sacrificed.

But our readers will inquire of us: Suppose this contention is continued for a month or six weeks longer, what are we to do for coal? We reply, Suppose our wheat crop should fail, causing a failure in flour, we would use rye flour and Indian and oatmeal, or import flour from abroad. So we say now, use Cumberland bituminous coal, or Provincial (Nova Scotia) and foreign coals, which are about the same thing.

Cumberland coal, particularly that procured from the mines of the Consolidation Coal Company, as its merits have become familiar to consumers during the past few years, has been largely used by the public. Manufacturers have found it superior to Anthracite coal as a steam-generator in the proportion of two tons of Cumberland to three tons of Anthracite, besides giving greater facility in firing-up. Railroads and Steamers have adopted it for similar reasons; and since the introduction in our dwellings of "low-down-grates," it has been found to give the warmest and most cheerful fire. Bituminous coal, in fact, furnishes the only good substitute for the old-fashioned log fire. For these reasons, Cumberland coal has become deservedly popular, We give below a table of the

COMPARATIVE STEAM-GENERATING POWER OF VARIOUS FUELS, TO CONVERT WATER AT 52° INTO STEAM AT 220°, WITH ONE LB. FUEL.

1 lb. Dry Pine Wood,	Evaporated	3.10 lbs. Water.
" Dry Oak,	"	4.85 "
" English Staffordshire Coal,	"	6.04 "
" Splint Coal,	"	6.75 "
" American Anthracite,	"	7.00 "
" Coke, made in close vessels,	"	7.70 "
" New Castle Coal,	"	7.90 "
" Best Wallsend,	"	8.60 "
" CUMBERLAND,	"	10.00 "

ANALYSIS OF CONSOLIDATION COMPANY'S COAL.

SAMPLE OF COAL YIELDED.	PERCENTAGE.
ELEMENTS.	
Water	1.010
Gases	13.920
Coke	81.960
Ash	3.110
	100.000

ASHES YIELDED.		HEATING POWER, BY COMPARISON.	
		PURE CARB.	COAL.
Silica	63.11	34.56	23.50
Iron and Alu.	16.41		
Lime	15.06		
Sulph. and Carb. Acid.	traces	OR AS	
Loss	42	100 TO 67.99	
	100.00		

We are thus particular in laying these facts before our readers, in order that they may inform themselves upon the relative value of the Anthracite and Cumberland coals, and in turn educate their customers, who will buy as readily of one as the other, when convinced of its merit. Our Cumberland coals have played second fiddle to the Anthracite coals long enough; and it is high time that they came into general use. Many of our influential retail Coal Dealers have of late, devoted a portion of their yards to the sale of Cumberland coals, and have found it a very profitable branch of their business, even in ordinary times. On occasions like the present, the wisdom of this course is evident. The business of such dealers is not interrupted, as they have regular customers for both kinds. It has been asserted by some that Cumberland coal cannot be used in stoves, ranges, etc. Let the necessity be once felt for a stove or range to burn this coal, and our inventors will very soon adapt our present stoves and ranges to its use or give us something better, just as patterns were accommodated to the use of Anthracite coal when it superseded wood.

PRICES.—Cumberland. Orders are taken at from $8 @ $9 alongside at New York—the difference being governed by the relatively higher price of coal at Baltimore, transported by railroad, and that at Georgetown, transported to tide-water to canal. Rates of freight also fluctuate, at a season when tonnage is not freely offering.

☞Freights have advanced from $2 to $2 35 from Georgetown to New York, in view of the increasing demand in this port. A corresponding advance had been noticed at Baltimore.

At Georgetown and Baltimore no advance has been made over opening rates of last season. We understand that coal is freely offered $4 50 at the former, and $4 75 at the latter port.

Anthracite—There is so little in the market that we cannot make quotations with satisfaction, from $10 to $12 seems to be the commanding prices.

FREIGHTS.—In consequence of the small amount of orders, freights rule low.

Anthracite Coal Trade for 1870 and 1871.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Feb. 25, 1871, compared with week ending Feb. 26, 1870.

COMPANIES.	1870. WEEK.	1870. TOTAL.	1871. WEEK.	1871. TOTAL.
*Phila & Reading R.R.	40,116	508,387	13,496	553,973
†Schuylkill Canal	....	34 373	....	36,225
Lehigh Valley R. R.	46,136	572 701	8.449	346,475
Lehigh & Sus. R. R.	9,810	130,879	1,904	55,665
†Lehigh Canal	....	....	....	.....
Scranton North	11,351	96,783	....	.....
" South	31,519	244,023	..	.....
Penn. Coal Co., rail	14, 121	134,974	....	2,760
" " canal	....	....	....	....
Del. & Hud. Canal Co.	....	....	....	....
" East	6,095	78,853	....	48,323
" " West	1,323	14,706	....	12,721
South	2,442	20,017	....	....
Shamokin	....	44,331	14,046	54,087
Trevorton	286	3,220	..	....
Lykens Valley Coal Co.	....	....	....	10,046
Wyoming South	....	....	....	....
Wyoming North	.....	....	....	....
P. N. Y. C. & R. R. Co.	....	38,780	....	42
Williamstown, Col'y	5,199	28,407	....	....
Big Lick Col	....	....	116	50 5
Total	169,598	1,706,411	38,612	1,184,322
1870	38,612	1,184,322		
Increase week and year	130,986	522,089		

*Less coal transported for Company's use and Bituminous coal.
†Closed for the season.

Bituminous Coal Trade, 1870 and 1871.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Feb. 25, 1871, compared with week ending Feb. 26, 1870.

COMPANIES.	1870. Week.	1870. Year.	1871. Week.	1871. Year.
B. & O. R. R.		68,606	16,036	110,249
C. & O. Canal				
H. & B. T. R. R.	4,706	29,120	4,865	34,526
Harrisburg & D.	8,703	77,461	8,902	63,542
L. V. R. R.		552		5,484
P. & N.Y.C. & R. Co.	1,323	3,878		30,084
Total	14,732	179,617	29,803	243,885

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE
For the Week ending Saturday, February 25, 1871.
BY RAILROAD.—ANTHRACITE.
PASSING OVER MAIN LINE AND LEB VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	431	06
" Port Carbon	766	12
" Pottsville	2,033	14
" Schuylkill Haven	724	14
" Pine Grove	8,424	09
" Tamaqua	1,384	13
" Harrisburg		
" Dauphin		
Total	13,768	08

SHIPPED WESTWARD VIA NORTHERN CENTRAL RAILROAD.

Passing Locust Gap	2,829	10
" Shamokin	7,455	18
" Herndon		
Total	10,285	08

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	671	12
" Lebanon & Pine Grove Branch	282	06
Total	953	18

CONSUMED ON LATERALS.

From Frackville Scales		
" Mill Creek	133	03
" Schuylkill Valley Scales	852	02
" Mt. Carbon	837	16
" Dressona	327	13
" Pine Grove	90	02
" Tamaqua	175	15
" Shamokin		
" Trevorton		
Total	2,416	11

LEHIGH AND WYOMING COAL.

Received via Allentown, L. Penn'a Br.		
" " Alburtis		
" " Plymouth R. R. & N. Br.		
" " Connecting R. R.		
" " Willow Street R. R.		
Total		

BITUMINOUS.

From Harrisburg	7,517	16
" Connecting R. R., G. & N. Br.		
" Junction R. R.	205	06
Total	7,723	02

COAL FOR COMPANY'S USE.

Anthracite	1,340	07
Bituminous	684	17
Total	2,025	04

RECAPITULATION.

	Total for Week.	Corresponding week last Year.	Increase.
Passing over Main Line and Leb. Val Branch	13,768 08	47,262 00	
For Shipment by Canal	—	—	
Shipped Westward via Northern Central R. R.	10,285 08	3,671 06	6,614 02
Shipped West or South from Pine Grove	953 18	484 19	468 19
Consumed on Laterals	2,416 11	2,237 09	152 02
Lehigh and Wyoming Coal		27 10	
Total Anthracite paying fr'gt	27,424 05	53,703 04	1,795 06
Bituminous	7,723 02	5,927 16	
Total of all kinds paying fr'gt	35,147 07	59,631 00	
Coal for Company's use	2,025 04	2,427 16	
Total Tonnage for Week	37 172 11	62,058 16	
Since Dec. 1, 1870	635,918 10	672,118 03	
Total to date	673,091 01	741,176 19	

SHIPPED BY CANAL.

	Total for Week.	Corresponding week last Year.	Increase.
From Schuylkill Haven	—	—	—
" Port Clinton	—	—	—
Total Tonnage per Week	—	—	—
Since Dec. 1, 1870	—	—	—
Total to date	36,225 17	34,373 16	1,852 01

Shipments of Cumberland Coal

or the week ending Saturday, February 25, and for the year 1871:

SHIPPED BY	B. & O. R. R.	C. & O. CANAL.	TOTAL.
Cooke M	.....	.....	.....
Borden	1,146 17	.....	.....
Consolidation	632 06	.....	.....
Spruce Hill	351 12	.....	.....
Midlothian	1,321 06	.....	.....
H. and Baltimore	751 10	.....	.....
do Va M	1,606 06	.....	.....
V C & I Co	1,665 02	.....	.....
G. C. C. and I	712 09	.....	.....
Maryland	1,945 02	.....	.....
American	934 02	.....	.....
Atlantic	638 08	.....	.....
Piedmont	1,507 10	.....	.....
Swanton	600 00	.....	.....
Barton	608 00	.....	.....
Potomac	1,170 05	.....	.....
Franklin	885 09	.....	.....
George's Creek M. C.	....	.....	.....
Big Vein	259 17	.....	.....
Total week	16,036 01	.....	16,036 01
Previous	94,213 08	.....	94,213 08
Total year	110,249 09	.....	110,249 09

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending February 25, 1871—Compared with same time last year.

WHERE SHIPPED FROM	WEEK 1871.. tons ct	WEEK 1870. tons ct.	YEAR. 1871 tons cwt.	YEAR. 1870. tons cwt.
Wyoming Region	3200 11	9862 17	42776 15	10 943 11
Upper Lehigh Region		865 14	4614 06	5716 17
Mahanoy Region	39 17	257 10	744 02	1072 06
Hazleton Region			1043 03	
Beaver Meadow Region			16523 08	23948 17
Tresckow Region				
Mauch Chunk Region	659 06	21 04		
Totals	3899 14	11007 05	65701 14	137679 17
Increase	7107 11		71977 03	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	1904 09	9810 07	59665 14	130879 11
Forwarded East of Mch Chunk by Canal				
Delivered at and above Mauch Chunk	1995 05	702 18	6036 00	4987 06
Delivered to L. & B. R. R. at Plymouth Bridge		494 00		1831 20
L. V. R. R. at Sugar N.				
Totals	3899 14	11007 05	65701 14	137679 17
Of the above there was transported on acc'nt of L. C. & N. Co.	659 06	1021 06	17759 15	3669 07
W.-B. C. & I. Co	1081 14	4183 13	31940 12	4320 07
Totals	1741 00	5204 19	49700 07	7989 14
Increase	3463 19		30249 07	
Decrease				

Philadelphia and Reading R. R.

Amount of coal transported on the Philadelphia and Reading Railroad, Saturday, Feb. 25, 1871;

From St Clair		
" Port Carbon	431	06
" Pottsville	766	12
" Schuylkill Haven	2,033	14
" Auburn	1,340	13
" Port Clinton	8,424	09
" Allentown and Alburtis		
" Harrisburg and Dauphin	8,902	09
Total paying freight	23,398	06
Coal for Company's use	2,025	17
Total for week	24,424	23
Previously this year	526,132	04
Total	550,556	06
To same time last year	626,586	04

Pennsylvania Coal Company,

Shipments of Pittston Coal for the week ending February 25, 1871.

	1871. WEEK.	1871. YEAR.	1870. WEEK.	1870. YEAR.
By Railway	— —	2,760 14	14,421 19	134,976 18
" Canal	— —	— —	— —	— —
Total	— —	2,760 14	14,421 19	134,976 18

Decrease 132,216 04 tons.

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending February 25, 1871, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons.	WEEK. Cwt.	TOTAL Tons.	TOTAL Cwt.
Total Wyoming	2,063	10	69,272	08
" Hazleton			205,204	14
" Upper Lehigh			442	06
" Beaver Meadow	2,956	08	69,767	08
" Mahanoy	5,220	17	60,502	07
" Mauch Chunk	171	01	1,238	01
Total Anthracite	10,411	16	406,537	03
Bituminous Coal from all sources			5,484	00
Total by rail and canal	10,411	16	412,021	03
Same time last year	54,180	17	647,004	07
Increase				
Decrease	43,778	01	234,983	05
Forwarded East from M'h Chunk by rail	8,449	00	346,475	17
Same time last year	46,136	04	572,701	09
Increase				
Decrease	37,687	04	226,225	11

RECAPITULATION.

Forwarded East from M'h Chunk by rail	8,449 00	346,475 17
To N. C. R. R., at Mount Carmel		18 00
Forwarded North from L. & B. Junction	712 13	33,784 15
To L. & S. R. R. at Packerton for rail	40 06	1,917 05
Delivered at M'h Chunk		
Delivered on line of road above Mauch Chunk	16 08	339 11
Delivered above M. Chunk for use of L. V. R.R.	532 17	3,152 17
To L. & S. R.R., at P'n Hav., for railroad	660 12	11,262 08
Do. for canal		94 10
At M. Chunk for canal		7,060 19
Total Anthracite	10,411 16	406,537 03
Bituminous Coal		5,484 00
Total all kinds	10,411 16	412,021 03

Delaware and Hudson Canal Company.

The following is a statement of Coal transported by the Delaware and Hudson Canal Co., for the week ending February 25, 1871.

	WEEK.	SEASON.
By Del. and Hud. Canal		
By Railroad East	suspension.	48,323
" West		12,721
" South		
TOTAL TONS,		61,053
For the same period last year.		
By Del. and Hud. Canal		
By Railroad East	6,095 00	78,853
" West	1,323 00	14,706
" South	2,442 00	20,017
TOTAL TONS,	9,860 00	113,576

Report of Coal forwarded by Pa. & N. Y. R. R. Co.,

for week ending February 25, 1871.

	WEEK. Tons.	WEEK. Cwt.	YEAR. Tons.	YEAR. Cwt.
By Rail	4,464	..	....	..
Previously this year	43,078	10	....	..
Total by Rail	....	..	....	..
By Canal	....	..	....	..
Previously this year	....	..	....	..
Total by Canal	....	..	....	..
Total for the year	47,542	10	....	..
To the same time last year	38,780	..	....	..
Increase	8,762	10	....	..

Company Coals.

March, 1871.

No quotations during strike.

	L.	Str.	Gra.	Eg.	Sto.	Che
Scranton at E. Port	—	—	—	—	—	—
Pittston at Weehawken	—	—	—	—	—	—
Lackawana at do	—	—	—	—	—	—
Wilk'b're at Hoboken	—	—	—	—	—	—
Old Co. Lehigh at Pt. Johnston	—	—	—	—	—	—
Lehigh at E. Port	—	—	—	—	—	—

For freights to different points, see "Freights."

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. March 4.		AT PHILADELPHIA. March 3.	
SCHUYLKILL.	R. A.	W. A.	R. A.	W. A.
Lump	$—	$—	—	—
Steamer,	—	—	—	—
Broken,	—	—	—	— to —
Egg	— to —	— to —	—	— to —
Stove	— to —	— to —	—	— to —
Chestnut	— to —	— to —	—	— to —
Pea	—	—	—	—
LEHIGH.				
Lump, (along side)	—	—	—	—
Broken	—	—	—	—
Egg	—	—	—	—
Stove	—	—	—	—
Chestnut	—	—	—	—
Pea	—	—	—	—
SPECIAL COALS.*				
Diamond Vein	R. A. 8 00		—	—
New England	"		—	—
Locust Dale	W. A. 7 50		—	—
Honey Brook, Le'h	W. A. 10 00 to 14 00		—	—
Spring Mountain	" 10 00 to 12 00		—	—
Sugar Creek	" " 10 00 to 12 00		—	—
Sugar Loaf	" " 10 00 to 12 00		—	—
Old Comp'y's	" " 10 00 to 12 00		—	—
Cross Creek	" " 10 00 to 12 00		—	—
Room Run	" "	— —	—	—
Girardville	" "	— —	—	4 75
McMichael	" "	— —	—	4 75
Shamokin	" "	7 50	5 25	— —
Lykens Valley	" "	— —	5 75	— —
Broad Top	" "	7 50	—	— —
Hill & Harris	" "	— —	4 75	— —
Henry Clay	" "	7 50	5 00	— —
Powelton	" "	7 50	— —	4 75

[*Dealers in these coals may be found in our advertising columns.]

Prices for Coal at Mauch Chunk.

March 1871.

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein	f.o.b. at Phila.	$ —
" Lemon "	" "	—
Cumberland Vein Coal		—
Consolidation Coal Co.'s on board	N. Y.	—
Maryland Coal Co.	"	—

Prices at Baltimore—March, 1871.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$—	@—
Pittston and Plymouth, do	—	@—
Shamokin Red or White Ash, do	—	@—
Lykens Valley Red Ash, do	—	@—
Zerba Valley	—	@—
Treverton	—	@—
By retail, all kinds per ton of 2240 lbs.	—	@—
Georges Creek & Cumberland f. o. b. at Lowest Point for cargoes	4 60	@4 75
Fairmont and Clarksburg gas, f. o. b. at L. Point	6 00	@6 50

Prices at Georget'n, D.C., & Alexandria, Va.

March, 1871.

George's Creek and Cumberland f. o. b. for shipping ..$4 75

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$—	@—
Lykens Valley	—	@—
Shamokin Red or White Ash	—	@—
Treverton and Zerba Valley	—	@—

Prices of Gas Coals.

March, 1871.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N.Y

Duty, $1 25, gold

	Coarse	Slack.
Block House	$1 75	@-75
Gowrie	1 75	@ 75

Corrected by Bird, Perkins & Job, 88 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25	@1 25
Sydney	2 25	@- 80
Lingan	1 75	@- 80
Little Glace Bay	1 75	@1 00
Caledonia	1 60	@- 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Currency.	
Westmoreland	7 75	@8 00
Fairmount Gas Coal Co. of N. Y.	7 50	@- —
Despard Coal Co.	$7 50	@- —
Penn	7 75	@8 00
Newburg Orrel Gas	—	@- —
West Fairmount Gs Caoal	8 00	@- —

AT PHILADELPHIA.

Powelton $7 80

Prices of Foreign Coals.

March, 1871.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street New York.

Liverpool Gas Caking	$ 9 00@— —
" " Cannel	11 50@12 50
" House "	— —@15 00
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00

Per ton 2,000 lbs. delivered.

Freights.—March, 1871.

TO EASTERN PORTS.	From Philada'a.	From E. Port and Port Johnson.	From Newburg.	From Rondout.
Amesbury	$2 50	$2 00		
Bangor	2 30	1 60		
Bath	2 30	1 75		
Boston	2 10	1 85		
Bridgeport	1 75	1 00		
Bristol	2 00	1 40		
Cambridgeport	2 75	2 00		
Derby	2 00	1 20		
Dighton	2 30	— —		
East Cambridge	2 35	2 00		
Fall River	2 50	1 40		
Hackensack	1 75	1 00		
Hartford	2 50	1 50		
Jersey City	1 40	60		
Middletown	2 25	1 25		
Mystic	— —	1 25		
New Bedford	2 00	1 40		
Newburyport	2 65	1 85		
New Haven	1 90	1 00		
New London	1 76	1 25		
Newport	2 00	1 40		
New York	1 35	60		
Norwalk	1 80	1 00		
Norwich	2 00	1 30		
Pawtucket	2 30	1 50		
Portland	2 30	1 50		
Portsmouth, N. H.	1 45	1 85		
Providence	2 00	1 25		
Rockport	2 10	1 65		
Saco	2 25	1 75		
Sag Harbor	1 70	1 20		
Salem	2 35	1 65		
Stamford	2 00	1 00		
Stonington	2 00	1 30		
Taunton	2 30	1 75		
Warren	— —	1 40		
Washington	1 25			
TO RIVER PORTS.				
Albany				
Catskill				
Cocksackie				
Coeyman's				
Cold Spring				
Fishkill				
Haverstraw				
Hudson				
New York				
Nyack				
Poughkeepsie				
Rhinebeck				
Rondout				
Saugerties				
Sing Sing				
Stuyvesant				
Tarrytown				
Troy				
West Point				
Yonkers				

Foreign and Provincial Freights.

March, 1871.

Closed for the winter.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-3 tons ..... £14 00@£16 00

Liverpool, 5 per cent primage ..... 13s @16. ton

TO NEW YORK.

Provincial

Sidney	$ —
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

TO BOSTON.

Sydney	$ —
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

Rates of Transportation to Tide Water.

Closed for the Season.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Port Carbon	$4 00
Less drawback of 50 cents on all Coal shipped east of New Brunswick and south of Cape Henry.	

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$1 84
C. R. R., N. J., Easton to Elizabethport	2 09
Shipping expenses at Elizabethport	25
Warfage	10
Total	$4 88

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$1 84
C. R. R., of N. J., Easton to Pt. Johnson	2 72
Shipping expenses	25
Warfage	10
Total	$4 91

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ —
Morris & Essex R. R. Easton to Hoboken	—
Shipping expenses	—
Warfage	—
Total	$ —

TO SOUTH AMBOY.

L. V. R. R.	—
R. & D. R. R. / Cam. & Am. R. R.	—
Shipping Expenses,	—
Total	$ —

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	—
C. RR. of N. J. Easton to Elizabethport	—
Shipping expenses	—
Wharfage	—
Total	$ —

METALS.

NEW YORK, March 4, 1871.

IRON.—Duty: Bars, 1 to 1¼ cents ℔ lb; Railroad, 70 cents ℔ 100 lbs.; Boiler and Plate, 1¼ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ℔ lb; Pig, 7 ℔ ton; Polished Sheet, 3cents ℔ lb; Galvanized 2½; Scrap Cast, $6; Wrought, 8 per ton.

	Store Prices.
Pig, Scotch No. 1, ℔ ton	30 00@34 00
Pig, American, No. 1	33 00@34 00
Pig, American, No. 2	30 00@33 00
Pig, American, Forge	30 00@32 00
Bar Refined, English and American	— —@75 00
Bar Swedes, assorted sizes (gold)	85 00@100 00

	Store Prices, Cash.
Bar, Swedes, ord'y sizes, less 5 ℔ ct.	— —@110 00
Bar, Refined " "	74 00@ 79 —
Bar, Common " "	70 00@ — —
Scroll " "	97 50@125 —
Ovals and half-round " "	97 50@125 —
Band " "	92 50@ 95 00
Horse Shoe " "	95 —@ — —
Rods, ⅝ to 3-16 inch " "	82 50@ — —
Hoop " "	102 50@140 00
Nail rod	— —@6¾ —
Sheet, Russia, as to Nos. (gold)	10½@—11
Sheet, Single, D. and T. Common	—4½@— 6
Sheet, Galv'd, Nos. 14 to 26 10 and 12c. Nos. 27, 28, and 29, 13@14	
Rails, English (gold), ℔ ton	56 00 @58 00
Rails, American, at Works in Pa.	70 00 @72 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under, 2¾ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb. and 10 ℔ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ℔ lb	—	15	@— 18
English Spring (2d and 1st quality)	—	7	@— 10
English Blister (2d and 1st quality)	—	10	@— 17
English Machinery	—	11½	@— 14
English German (2d and 1st quality)	—	13	@— 15
American Blister "Black Diamond"	—	—	@— 12
American, Cast, Tool do.	—	16	@— 17
American, Spring, do.	—	9	@— 11
American Machinery, do.	—	—	@— 12
American German, do.	—	9	@— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb	— @— 30
Copper Bolts	— @— 32
Copper Braziers, 16oz. and over	— @— 32
Copper Nails	— @— 37
Copper, Old Sheathing, &c., clean	19 @— 20
Copper, Chili Pig	— @— —
Copper, American Ingot	21¼@— 22
Yellow Metal, New Sheating	— @— 22
Yellow Metal Bolts	24 @— —
Yellow Metal Nails	— @— 22

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1¼ cents ℔ lb: Pipe and Sheet, 2¾ cents ℔ lb.

Galena, ℔ 100 lbs.	$— @—
Spanish (gold)	6 20 @6 25
German, do.	6 20 @6 25
English, do.	6 20 @6 50
Bar (net)	— —@8 75
Pipe (net)	— —@10 25
Sheet	— —@10 25

Colwell, Shaw & Willard Tin-Lined Pipe 15 cts. ℔ lb.

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent.; Roofing 25. ad val.

	Gold ℔ lb.
Banca	38¼@39
Straits	33 @38¼
English	— @33

PLATES.

Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ℔ box	$8 @21¼@9 00	$10 00 @10 50
I. C. Coke	7 37½@7 75	8 37½@ 8 75
Coke Terne	6 25 @7 25	7 00 @ 8 00
Charcoal Terne	7 75 @8 25	8 75 @ 9 50

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ℔ lb.

		Gold.
Plates, Foreign	℔ 100 lbs.	$5 87 6 12½
Plates, Domestic	℔ lb.	8¼ 11½

REMARKS.

IRON.—There is very little doing in Scotch Pig. The supply continues light, and holders evince no disposition to dispose of stock except at prices above the views of buyers. The sales are 200 tons Eglinton at $29 50; 300 do. mixed brands, $31 50; and 300 do. Glengarnock, on private terms. American continues in request, but as the supply is being almost entirely exhausted, business is restricted, and prices have again appreciated, the market closing at $33 @ $34 for No. 1, and $31 @ $33 for No. 2, with sales of about 300 tons at these figures, and 250 do. Allentown, $31. There has been very little inquiry for new Rails, but former quotations are maintained—1,000 tons 56 lb. English sold at $54 50 gold, and 450 do. old Double-headed and T, on private terms. Refined Bar from store continues quiet, but holders are firm at a shade better price, there being few, if any, who will name less that $75 for assorted sizes. In Philadelphia $75 @ $77 50 is asked, and decline orders—200 tons Belgium refined Bar received via a Southern port, sold at $60 @ $62 50 currency.

LEAD.—There has been no business in Pig; ordinary Foreign is held at $6 20, gold. Bar, 8¼c., and Sheet and Pipe 10¼c., cash, less 10 per cent. to the Trade.

TIN.—Pig is without movement, and prices are entirely nominal; we quote Banca 38½ @ 39 cents; Straits 33 @ 33¼, and English 33, all gold. Plates in whole parcels have become quiet, though there is a good jobbing demand; prices remain quite firm. The sales are 8 @ 900 boxes Charcoal Tin, at $8.75 for I. C.: and 500 do. Charcoal Terne, at $7.75, all gold.

COPPER.—The manufactures of Copper and Yellow Metal are without change. Ingot is dull, and prices are scarcely sustained; sales have been made of 300,000 lbs. Lake and 50,000 lb. Tennessee at 21¾ cents—in small lots 21¾ @ 22 cents.

STEEL.—Store prices, which we quote, are steady, and stocks are good, both of English and American.

ZINC.—Spelter, foreign, 5¾ @ 6¼c. gold; Sheet Zinc, foreign, 8½ @ 9c.; to arrive at 8c. gold; Zinc Paint, foreign, 7¾c. gold; do. American, 7c.; Manganese, per oxide, 5c.

San Francisco Stock Market.

A late telegram from San Francisco quotes mining stocks as follows:—

Savage	43½
Yellow Jacket	38½
Kentuck	70
Chollar Potosi	76¼
Gould & Curry	46½
Belcher	34
Imperial	9
Amador	340
Crown Point	—
Hale & Norcross	—

Quick Time.

It is stated that by the establishment of the railroad ferry from San Francisco to Oakland, foreign cargoes can be reshipped from the Pacific steamers on the cars of the Pacific Railroad at the rate of from one thousand to fifteen hundred tons a day, and that the freight time from Japan to New York will be reduced to thirty-seven or forty days, and from Japan to England to fifty days. This transshipment is effected by means of the steamer "Thoroughfare," on which the loaded cars are carried across San Francisco bay in the same way that the cars used to be ferried across the Susquehannah at Havre de Grace. This route, it is stated, is beginning to be used by Englishmen in China for short runs home. Thus, recently, a gentleman making this trip was thirty days going from Shanghae to San Francisco, six and a half days more from San Francisco to New York, and in eleven days longer was in England, taking forty-nine days for his journey, including the necessary delays at the principal points. This exceedingly short time is a great reduction from the length of the journey in old-fashioned times, when it required four months to make the voyage between China and the United States. In 1855, great excitement prevailed in consequence of a clipper ship having made the passage from Shanghae to New York in eighty-five days and fourteen hours; and now the journey is made, partly by rail, in less than half that time. It may, however, be here mentioned, that on January 15 a steamship arrived at New York, via the Suez Canal, from Shanghae, in 130 days; and that on the same day a sailing vessel arrived at the same port from Shanghae, by the way of the Cape of Good Hope, in 137 days, the steamer sailing on September 7, and the ship on August 31. Hence the Atlantic Ocean routes are still quite as uncertain as ever, even with the aid of steam and of the Suez Canal.—*Public Ledger.*

Rolling Railway Axles.

A COMMUNICATION was recently made to the British Association upon a method for shaping railway axles by rolling pressure, instead of by hammering, the result being accomplished in two minutes, instead of half an hour, as required by the usual method; the axle at the same time being not only superior in quality, but more uniform in size, and of course capable of being produced more cheaply. The machine consists of three rollers regulated so as gradually to press more closely together, thus reducing the diameter of the bar, and extending its length until shaped to the size required. Axles of any length can be rolled in this manner with collars at any part. The rollers are geared to revolve in all the same direction, their friction imparting motion to the axle. It was thought by the author of the communication that the rolling process would tend to obviate those flaws in axles which so frequently cause disasters on railways.

Railway Passenger Traffic.

THERE are sixteen railways in Great Britain, each of which carried more than five million of passengers in the year 1869. The Manchester, Sheffield, and Lincolnshire line carried 6,991,371; the North British, 8,507,171; the Great Northern, 8,733,764; the Caledonian, 9,226,684; the North-Eastern, 11,944,315; the Great Eastern, 13,008,907; the South-Western, 13,143,453; the Chatham, 13,963,882; the Midland, 15,567,454; the Brighton, 16,560,431; the South-Eastern, 19,157,205; the North London, 20,620,750; the Lancashire and Yorkshire, 22,643,002; the Great Western, 23,103,406; the London and North-Western, 28,758,886; and the Metropolitan (including the District, St. John's Wood, and half the Hammersmith), no less than 36,893,791. These numbers are below the actual ones, as they do not include the holders of season or periodical tickets; the number of journeys taken by these persons is not known, but it has been estimated at about 350 each. The Great Eastern had, in the year 1869, 4899 holders of such tickets; the Great Northern, 8261; the Great Western, 4300; the Lancashire and Yorkshire, 8487; the London and North-Western, 11,299; the South-Western, 8651; the Chatham, 8568; the Sheffield, 1814; the North-Eastern, 4928; the Caledonian, 6671; the North-British, 6918.

Ammonia Gunpowder.

THE owners of the Nora-Gyttorp Powder Mill, Sweden, have brought out a new kind of powder, which contains, it appears, a mixture of nitrate of ammonia and nitrate of potassa (with what other substance is not said.) This material is, according to some accounts, a more powerful explosive than nitro-glycerine, and cannot be ignited or made to explode, but by the impact of a blow, or a falling weight, or by the detonation of a small cartridge containing common gunpowder. Experiments made at a military establishment at Berlin with this powder have proved that, while ordinary gunpowder, gun-cotton, nitro-glycerine, and dynamite take fire the moment flame is approached, this powder did not do so. As regards the effect of the impact of a blow of a falling weight (the same, of course, in each case), ordinary gunpowder requires for explosion that the weight falls from a height of between 4 and 5 feet; nitro-glycerine, 1½ feet; dynamite, 3½ feet; and ammonia gunpowder between 12 and 15 feet. A sample having been sent to France from Berlin did not, the author says, confirm the high opinion this substance is thought worthy of in Prussia.

Chinese Gold Lacker.

A German experimenter has lately discovered the method of producing the celebrated Chinese gold lacker, his imitations being entirely successful. His method of preparing this substance is to melt two parts of copal and one of shellac, so as to form a perfect fluid mixture, and then add two parts of hot boiled oil. The vessel is then to be removed from the fire and ten parts of oil of turpentine gradually added. To improve the color an addition is made of a solution in turpentine of gum gutta, for yellow, and dragons blood for red. These are to be mixed in sufficient quantity to give the desired shade. The Chinese apparently use tin foil to form a ground, upon which the lacker varnish is laid.

Movable Axles.

THE Russian Government has given orders to construct a number of railway carriages with movable axles. These carriages will have the advantage of fitting the broad gauge of their own rails as well as the narrow one adopted in the rest of Europe. In other words, while foreign troops cannot be sent to Russia in foreign railway conveyances, the Russians will be able to enter foreign territory in their own.

DEPARTMENT OF PUBLIC WORKS, No. 237 BROADWAY.

TO CONTRACTORS.

Proposals inclosed in a sealed envelope, with the title of the work and the name of the bidder indorsed hereon, will be received at this office until TUESDAY, March 7, at 11 o'clock, A M.

For paving Twenty-second street, from Fourth avenue to Broadway, with Belgian pavement.

Blank forms of proposals, the specifications and agreements, the proper envelopes in which to inclose the bids, and any further information desired, can be had on application to the Contract Clerk at this office.

WILLIAM M. TWEED, Commissioner of Public Works.

New York, February 24, 1871.

EDSON'S

RECORDING STEAM GAUGE. These Gauges give an Automatically Written Record of all fluctuations in Pressure, to which a boiler has been subjected.

They Reduce the Risk of Explosions, by prompting a more careful attention to duty.

They Economise Coal, by showing when the firing is not periodically and properly done.

They Sound an Alarm when the limit of pressure is reached, and are adapted for Locomotives, Marine and Stationary Boilers.

Manufactured and for sale by the RECORDING STEAM GAUGE CO. 91 Liberty street, N. w York.

ADOLPH OTT, CHEMICAL ENGINEER,

May be employed professionally as an expert on practical subjects, involving both Chemical and Mechanical knowledge. A specialist in various branches of Technology. Assays and Analyses of all kinds. Address, Editorial Rooms of the "Engineering and Mining Journal," 37 Park Row, New York City.

☞ Written communications preferred. nov28-tf

J. THOULET & C. RASCHER, MINING AND CIVIL Engineers, Maps, Topographical and Mining Surveys, Superintendence of Mines, Metallurgical and Chemical Works, Examinations and Reports on Coal and Metallic Mines, Assays, etc., Oriental building, 122 La Salle street.

MAGIC LANTERNS FOR SUNDAY Schools, Academies, Public Exhibitions, and Parlor Entertainments. Illustrated priced catalogues sent free. T. H. McALLISTER, Optician, Dec.21:3m. 49 Nassau street, N.Y.

Architecture.

THE following is an abstract of a very interesting lecture delivered by Mr. P. B. WIGHT, Secretary of the American Institute of Architects, and the designer of several public buildings, both in this city and in Brooklyn, among which we may mention the New York Academy of Design and the Mercantile Library building in Brooklyn :

"The lecturer alluded to the difficulty of making a lecture on architecture interesting to an audience, notwithstanding the interest the subject itself excites. It was necessary for the lecturer to find some chord of sympathy between his subject and his auditors. This was found in the fact that there are few vocations upon which the well-being of the community generally depends more than architecture. The necessity that people be well housed brings them necessarily into intimate relations with the architectural profession, upon which, often without knowing it, it depends for many of the comforts of life. He said that his auditors were all patrons of architecture, whether they owned their houses or hired them, whether they occupied a floor or a single room ; for architecture relates to every detail and contrivance of the houses in which we live, as well as those wherein we transact business, worship, or assemble for purposes of amusement. He then explained the great extent of the field of architectural literature, to demonstrate how vast was the subject undertaken, and how little could be expected from a single discourse. Architecture, though seldom the subject of popular lectures, is one which has been handled by some of the greatest thinkers of all times, from VITRUVIUS to QUATREMERE DE QUINCY, RUSKIN and VIOLLET-LE-DUC of our own time. He referred to the elaborate works of PALADIO, and to a curious work on architecture written by the painter REUBENS. He only asked his auditors to listen to a few remarks on architecture, in its practical relation to the needs of the present day. He would attempt to define it and analyze it in the aspect of a living art of modern times, calling, in its practice, for the services of a trained body of men known as architects, who have a responsible duty to perform to their age and generation. For architecture, in our day, if it be an art worth fostering and encouraging, must be a living, breathing, working and teaching art. It must be an art of and for the people. It can be for no exclusive set of amateurs, who have assumed to possess the sum of human knowledge, and to be the only judges of what is elevating and refining in its influences. It must be an art which will be easily understood when plainly taught. Its relation to the happiness and well-being of mankind must be known and appreciated. The community must learn to regard it as a helpful comforter, contributing its share to the improvement of our social state, no less than our æsthetic gratification. From such a point of view he would endeavor to introduce the subject.

"These were taken up in detail. Convenient arrangement was considered in relation to its effect upon the value of real estate and the profitable or unprofitable investment of money in buildings. The present Custom-House was mentioned as a building which had been sold for one-half of its actual cost, because it was so planned as to be of little value for any purpose, and was so massive that it could not be taken down except at enormous expense. It therefore was an incumbrance rather than an improvement to the ground it occupied. The indifference of building committees to the arrangement of plans submitted in competition was referred to, and the fact that they are the principal sufferers by such neglect, getting often badly-arranged buildings as a result, was alluded to. But architects also suffer from such treatment, and often valuable and carefully thought-out plans go unrewarded. Comparison was made between the arrangement of dwellings of the wealthy classes in Europe and this country, and in domestic arrangements the American houses were considered superior, though inferior in other respects. The necessity for more apartment houses on the European plan was strongly urged. The tenement-house question was then considered at some length, and the lecturer could see no better relief for the poor of New York than rapid and cheap transit to better neighborhoods—that being the question in which the poor are mainly concerned. A few improvements could be made in the arrangement of tenement-houses ; but little could be hoped for as long as the demand exceeds the supply and landlords net ten per cent. Improvements can be made in some of the more expensive tenement-houses at little cost, which will make them nearly as good as apartment houses. The importance of light, both as a matter of convenience and for sanitary purposes, was dwelt upon. The pale complexion of our American women was attributed to the fact that the light was excluded too much from our dwellings in the daytime, not by reason of the windows being small, but because people insist upon keeping blinds and shutters closed. Stores were considered to have generally too much window surface ; for often the merchants, after demanding that their stores shall consist mainly of windows, resort to various contrivances for excluding the light. The use of cast-iron for the fronts of stores was discouraged, because enough light could be obtained where brick, stone or marble are used. The ingenuity of our architects in providing light for the rears of stores, and economizing ground without depriving them of light, was commended. The general use of stained glass as the only proper material for church windows was urged, and the conditions affecting its use were detailed. Stained glass was also recommended for secular use, and instances of its successful application, especially in the Brooklyn Mercantile Library, erected by the speaker, were given.

"Architecture, in its simplest signification, is 'the art of building.' The best authorities differ in defining the word, but this difference arises from their considering architecture in the light of an art in one case, of a science in another, or as both. The lecturer preferred to consider it in the latter and most comprehensive sense. He quoted RUSKIN'S beautiful definition of architecture, considered as a fine art, and accepted it as a partial explanation of the meaning of the word. The art of building, he said, included building and the adornment of buildings ; for the value and effect of decoration depends upon its harmony with constructive propriety, and no good architecture can exist unless it consists of rational construction, adorned in such a manner as to emphasize rather than conceal the office of the materials employed. The word architecture also comprehended monumental and engineering works, and decoration of them, but for the simplification of the subject they would be left out of consideration. The lecturer then analyzed his subject as follows : The art of building comprises two things which necessarily are combined in every work of architecture. They are : 1st, The science of building ; 2d, The fine art of building.

"The science of building relates to methods of arrangement and construction. The fine art of building consists of arrangement with reference to effect and proportion, the combining and arranging of constructive features so as to produce an effect of beauty, and decorating them in harmony with the works of nature which surround them. The science of building comprises mainly two things—the arrangement and disposition of the different parts, so that the structure may best subserve the use for which it is intended—or planning ; and the disposition of the materials in accordance with their several properties, so that it may be strong and durable—or construction. The important considerations which enter into planning are as follows : Convenience, light, air (including ventilation) and water (including drainage).

"The lecturer then took up the subject of 'Air,' including heating and ventilation, and objected to the introduction of 'systems' of ventilation, which were not capable of general application. He contended that the subject should be studied as a science by architects, and by them applied to their own buildings. Ventilation, he said, is a science, having special application to every room and every house that is built, being a special problem to be solved in each case according to varying conditions. Unfortunately for those who have given much attention to it, they get no credit for what they succeed in ; for when a room is well ventilated no one noticed it ; but, if badly ventilated, complaints are loud and numerous. Under the heading 'Water,' general principles of water supply and drainage were considered. The Mansard roof was condemned by the lecturer, but he urged that the roof should always be visible. The plumber's trade has been brought nearer to perfection in this country than any other connected with building, and in the supply of water, luxurious baths and drainage, we surpass all other countries.

"The lecturer gave an outline of the principles of construction, and after alluding to the second division of the main subject, the consideration of architecture as a fine art, which time would not permit him to enlarge upon, concluded as follows : I have endeavored to bring the subject, architecture, before you to-night, mainly in its practical aspects. I have said much about the profession to which I belong, because its practitioners are, in one sense, the servants of the public, and you are its patrons. When the word architecture is mentioned every one knows that it has something to do with cathedrals and temples—those grand works of antiquity which are your delight and our study—but when we say architect, it is not so easy to determine what part of them is to be attributed to him. In fact, there is some mystery still, even to the minds of archæologists, both in the classic period and in the middle ages. But his profession at the present day is well defined ; not so generally understood by the world at large as the professions of a lawyer, a doctor, or an engineer, but having its traditions, its precedents, its well defined and pretty well understood usages."

Oregon in Congress.

THE importance of Eastern Oregon is derived from the fact that the new Senator, Col. JAMES K. KELLY, and the new Representative, Mr. JAMES H. SLATER, are both from this section of the State. Both these gentlemen are lawyers ; but Mr. SLATER is, in addition, specially identified with the mining interest, having personally handled the pick and shovel in the Blue Cañon gulch-mines, at Auburn. We may expect from him, therefore, an intelligent sympathy with the industry from the ranks of which he has risen by his own ability and perseverance.

Col. KELLY is enthusiastically eulogized by his fellow-citizens. If what they prophesy proves true, he will be a worthy successor to Senator WILLIAMS—which is saying a good deal.

The Rights of Workmen.

WE extract the following from an editorial in the *U. S. Railroad and Mining Register*, on the coal-miners' strike in Pennsylvania :

One class of people have no right to organize society against the rights of other classes. If their occupation or trade be an unhappy one, they must change it, abandon it, or endure it patiently—whichever they please or can—and still remain in harmony with the common weal. The miners complain of hard work and poor pay, the dark, the smoke, the damp, the dangers of their mine, their insecure tenure of homestead, the wretchedness of their shanty villages, etc., etc. All these combined afford no excuse for stopping the iron manufacture and making the fuel bills of honest mechanics in the lowlands exorbitant. Other trades are dirty, unwholesome and dangerous, as well as their own. More operatives die lingering deaths at needle-polishing, wool-spinning, and in a score of other employments, than are killed or injured in mining coal. And very few trades are half so well paid as coal mining, provided the miner be temperate and frugal. No, the trouble is, our miners are not willing to face the inevitable ills of life like other people, first, with Christian fortitude ; secondly, with sobriety and economy ; and thirdly, with such good use of their intellects as would overcome some of the difficulties of their position, and greatly lessen the rest. They do not care for schools, or they would have them. They support at a great expense lazy demagogues, instead of hiring at a small expense first-class male and female school-teachers, building roomy school-houses, buying first-class libraries for them, laying out nice streets and planting nice gardens in their mining villages, thus training up their young people to be masters of this coal question.

The Calcasieu Sulphur Mines of Louisiana.

I.

GENERAL TOPOGRAPHY OF THE COUNTRY.

THAT portion of Louisiana which borders on the Gulf of Mexico, and lies between the Mississippi and Sabine rivers, forms, for a distance of one hundred miles or more, inland from the coast, an almost unbroken plain, interspersed with bays, lakes, and swamps, elevated but a few feet above the level of the sea, and traversed by bayous or rivers, usually running from north to south, and subject, for some distance in the interior, to the ebb and flow of the tide. The great prairies, properly so called, lie between Bayou Teche and the Sabine, which divides Louisiana from Texas. These prairies are devoid of trees, except along the water-courses, but are everywhere covered with a luxuriant growth of prairie grass, intermingled in certain localities with flowers of the most beautiful and variegated colors. Countless herds of cattle and horses feed upon these immense plains all the year round, without shelter of any kind ; and even in winter, it is said, fatten upon the rich pasturage they afford. For some little distance east of the Mermenteau river, and from thence west to the Sabine, the prairies are marked with innumerable little elevations, circular in form, from one to three feet in height, and from ten to thirty feet in diameter. These mounds or hillocks are clothed with grass, like the prairies, but west of the Calcasieu river they are covered with a dense vegetation of trees and undergrowth, and are called "islands" by a figure of speech, which suggests to the imagination the resemblance of the immense prairies, bounded by the horizon, to the great ocean, and of these little elevations above the common level, to the islands of the sea.

It is beneath one of these islands that the great deposits of sulphur have been discovered.

The origin of these hillocks or islands has engaged the attention of the scientific, and they are yet a puzzle to the geologist. For want of a better theory, many persons have adopted that of an intelligent professional gentleman, residing in Calcasieu parish, who ascribes their formation to the gradual ebullition of gases from below, through many ages, bringing up small particles of earth or sand, and depositing them on the surface. The constant uprising of gases through the superincumbent water, which in the winter season covers the prairies in many places, seems to support the theory ; and it is said to have been ascertained by experiment, that the soil which composes these hillocks is of a different character from that of the surrounding prairies, but is formed of the same identical material as that of certain strata, lying at varying depths below the surface of the land.

Besides these smaller elevations, which are numbered by millions, there are others of larger dimensions, and of such a nature as to fix the attention even of the uneducated, as well as to provoke scientific investigation. These are Belle Isle, on the Gulf coast, and overlooking its waters, Petit Ause, or Avery's Island, and Miller's Island, all of which attain the height of about eighty feet above the surrounding country, and look like miniature mountains rising out of the plain. Like the prairies, they are barren of trees or other vegetation than the usual prairie grass, except where the China tree has been planted by the hand of man, near human habitations, to afford shelter from the sun. Petit Ause, or Avery's Island, has been found to contain one of the richest deposits of rock-salt known in the world, and the mine is being profitably worked by a company organized for that purpose. These islands lie in a direction running northwest and southeast, from fifteen to twenty-five miles apart, and a line drawn through them falls near the sulphur deposits in the parish of Calcasieu.

The locality of the sulphur mines has been long known to the old settlers as the "Oil Springs," and it is said that the Indians originally visited the springs in large numbers, and applied the oil for the cure of rheumatism and ulcers with great success.

About the year 1860, and subsequently when the oil springs of Pennsylvania and Virginia began to attract attention, the lands upon which the springs were found were entered and patented by the present owners, as well as additional lands adjoining the first entries. Samples of the oil were analyzed, and were pronounced to be petroleum oil of fine quality. A company in process of organization to operate for petroleum was broken up by the war. In 1865 a shrewd capitalist engaged the services of a gentleman of high scientific attainments,* then filling a professor's chair in the University of Louisiana, to examine the topography of the country and analyze the oil ; the result of which was a lease of the lands for ten years, upon the payment of twenty thousand dollars cash and the one-half of the yield of the mineral oil to be found. In 1866 this lease was transferred to the Louisiana Petroleum and Coal Oil Company, incorporated under the laws of Louisiana, which at once commenced operations for boring for petroleum oil. W.

* J. W. Mallett, M. D., Professor of Chemistry and Mineralogy, University of Louisiana.

THE ENGINEERING AND MINING JOURNAL.

CONTENTS FOR THIS WEEK.

[*Illustrated Articles are marked with an asterisk.**]

The Discovery of Actual Glaciers on the Pacific Slope..... 145
Proposed Water Supply for Portions of Hudson, Essex and Union Counties, N. J..... 146
The Relation Existing between Chemistry and Mineralogy ... 146
Steam Road Rolling..... 147
Central American Sulphurets—Method of Manipulation in Guiana..... 147
Hacolumite (Articulite) 148
A New Pyrometer..... 148
MINING SUMMARY.....148-149
MARKET REVIEW..... 150
Quick Time..... 151
Rolling Railway Axles..... 151
Railway Passenger Traffic..... 151
Ammonia Gunpowder..... 151
Chinese Gold Lacker..... 151
Movable Axles..... 151
Architecture..... 152
Oregon in Congress..... 152
The Rights of Workmen..... 152
The Calcasieu Sulphur Mines of Louisiana..... 152
EDITORIALS:
The Northern Pacific Railroad.. 153
Coal and Railroads..... 153
The Tribune's Metallurgy..... 153
Onondaga Salt..... 153
Water for Syracuse..... 154
Compressed Air Railway Car.... 154
The Determination of Sulphur in Cast-Iron. 155
OFFICIAL LIST OF PATENTS... 155-156
Business and Personal..... 156
Important to Inventors..... 156
Advertisements..... 157

ROSSITER W. RAYMOND, Ph. D., Editor.

PUBLISHERS' ANNOUNCEMENT.

THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.*

SUBSCRIPTION—*$4 per annum in advance; $2 25 for Six Months.*

ADVERTISEMENTS.—*The rates are as follows: Inside pages, 25 cents per line each insertion; the outside or last page, 40 cents per line. Payment required in advance.*

NEWS-DEALERS *will be supplied through the agency of the* AMERICAN NEWS COMPANY, *No.* 121 *Nassau street, New York City.*

COMMUNICATIONS *of all kinds should be addressed to the Publishers. The safest method of transmitting moneys is by checks, or Post-office orders, made payable to their order.*

Correspondence and general communications of a character suited to the objects of THE ENGINEERING AND MINING JOURNAL *will always be welcome.*

The Postage on THE ENGINEERING AND MINING JOURNAL *is twenty cents a year, payable quarterly, in advance, at the office where received.*

WESTERN & COMPANY,

Publishers,

37 PARK ROW,

NEW YORK CITY.

P.O. Box, 5969.

The Northern Pacific Railroad.

THE public has reason to be satisfied with the hands into which this great enterprise has fallen. No one doubts that it will be prosecuted with energy, intelligence, and honesty, and that whatever can be done under the natural conditions of the case will be well done by the management of the road. The name and endorsement of JAY COOKE and Co. give great strength to the scheme; and there is a general willingness to accept its feasibility and early success as proved, on the mere authority of this sagacious and upright house. But the evidence on which JAY COOKE and Co. adopted this undertaking as their own, and stakeo in it their unblemished reputation, is accessible to all who desire to form an independent opinion; and it abundantly confirms the estimates and expectations of the company.

We find in the last report of Commissioner RAYMOND on the mineral resources of the Pacific slope, an interesting chapter on the route of the North Pacific Railroad, prepared by Mr. W. MILNOR ROBERTS, an engineer personally acquainted with the ground, and entitled to confidence, from which we make, this month, such extracts as our space will permit.

Grades.—Mr. ROBERTS, after describing the topography and giving the elevations, etc., of the route, concludes that "it is not probable that any main trunk line across the continent, or of equal length elsewhere on the globe, will present so small an aggregate rise and fall; and there will be but few points where changes of direction may not be effected with gentle curvature. There need be but two principal summits, whether the more northerly or southerly line be chosen; while the bulk of the line will consist of light grades and long tangents, on which passengers and freight can be cheaply transported."

Snow.—Mr. ROBERTS shows that "this line of road on the general route described will, in ordinary winters, be much less incumbered with snow where it crosses the mountains than are the passes at more southerly points, which are much more elevated above the sea. The difference of five to six degrees of latitude is more than compensated by the reduced elevation above the sea-level, and the climatic effect of the warm ocean currents from the equator ameliorating the seasons from the Pacific to the Rocky Mountains." He shows that the line of the Northern Pacific is, on the average, three thousand feet lower than that of the Union Pacific, which corresponds to a difference of nine degrees in latitude. So that, with reference to the snow-line, the North Pacific will be some three degrees south of the Union Pacific! There are certain points, however, on the northern line, where deep snow may be expected, and must be guarded against. But experience has already shown us that there is little interruption of traffic from this cause. The trains on the Union and Central Pacific roads have not been delayed by snow as much as those of New England or Iowa.

Cost of Construction and Operation.—Under this head Mr. ROBERTS says: "The cost of this railroad will be less per mile than the average cost of railroads in this country, owing to the rare water facilities, at many points for the cheap carriage of the iron and other materials required, and the large proportion of easy grading; and the cost of working it, owing to the predominance of light grades and curvature over the greater portion of the distance, and the facilities it possesses most of the way in good supplies of water, wood, and coal, will fall below the average."

National Importance.—The position of this line across the continent on the shortest practicable distance between the Pacific Ocean and the great lakes of the Atlantic side, establishes it as one of paramount importance in a national point of view, the value of which to the Government cannot easily be overrated. The facilities it will afford for the rapid and economical distribution of troops, ammunition, and stores for the numerous forts on the waters of the Missouri, the Yellowstone, etc., and along the valleys of Clark's River, Columbia River, and Puget Sound, will be invaluable for military purposes, and will save millions annually to the public treasury. A moderate estimate of the mere money-saving to the country will show not less than three per cent. on the entire cost of the road every year, for present military transportation alone, to forts now in existence. But more forts will be needed to hold the Indian tribes in check, as the white settlements shall be annually extended over Indian territory, a matter which is inevitable, and as certain as the ultimate extermination or absorption of the Indian race. The opening of this road will forever settle the question of white supremacy over an area of country covering at least four hundred and fifty thousand square miles, sufficient in extent to make ten States of the size of Pennsylvania.

Through Travel.—The Northern Pacific Railroad will be a most convenient route for trade and travel across the ocean from Asia and the Sandwich and other islands of the Pacific; for transporting Asiatic products quickly to the gold regions of Montana, and distributing them along the valleys of the Yellowstone, the Missouri, the Dakota, the Red River, the Mississippi, and the lake region. It is true that the main or most northerly terminus will be at Lake Superior, but connections with St. Paul, Milwaukee, and Chicago, etc., are certain to be made, which will put this line in direct communication with the entire railroad system of the United States and Canada.

The ocean currents of the Pacific are such that vessels from Asia, etc., destined even as far south as San Francisco, are compelled to make northing, which brings them on a parallel with Puget Sound. This is a very important fact in connection with the Northern Pacific route. This line, with the land grant secured to the company by the Government, possesses great intrinsic value, and will be, as a whole, remarkably favorable. If judiciously located, honestly constructed and properly administered, it will within a few years pay a fair dividend on its cost.

The subject of the lands granted to the company by the United States, their value and capacity for supporting a large population, and the question of the local traffic which already awaits railroad facilities and that which is certain to spring up on the completion of the road, and even during its construction, must be omitted from the present article.

Coal and Railroads.

MR. WOOD, of New York, by sudden and bold parliamentary tactics, won the other day from the House of Representatives a decisive vote, in favor of the bill abolishing all duties on foreign coal. As no anthracite coal is imported, this measure, if it becomes a law, will strike a blow at the bituminous coal business. The readiness of the House to pass it evidently arose from the desire to punish in some way the authors of the present coal famine. But, like all the legislation of passion, this punishes the wrong parties. The bituminous and semi-bituminous coals, competing to a limited extent with anthracite, are, in the present scarcity, our chief resource. For domestic uses the Cumberland coal is now in good demand, at reasonable prices. The policy of crippling the weak bituminous coal industry, because the powerful anthracite industry has grown arrogant, seems doubtful, to say the least. It is too much like the schoolboy's expedient of revenging himself upon a bullying adversary by throwing stones at his little sister.

Meanwhile, the hardships of the public continue, and are not likely to be relieved by any hasty legislation. Long before a law establishing the free importation of coal can have any decided effect upon our foreign supply, the present strike and blockade will have passed, and the conflict between labor and capital will have ended in a conquest or an armistice. The result is not to be prophesied; and the sympathy of the public is given to neither side, while its indignation is bestowed upon both.

The miners of Pennsylvania are proving that they are overpaid. Labor should be rewarded in proportion to the grade of skill and intelligence it requires; and when a body of merely manual laborers earn enough in six or eight months to be idle the rest of the year, they are earning too much. The companies have heretofore yielded to their demands and quietly shuffled the loss upon the public. The result is, that the organized miners have accumulated a mutiny-fund large enough to support them for several months. And now the capitalists find themselves losing the interest upon some $500,000,000, invested in mining and transportation. We do not blame them for resisting, nor for combining to resist, the exorbitant demands of the miners' union; but they have no right to draw the public into the fight. When the two parties are at peace, they agree to plunder the public; when they fall out, the honest public, in spite of the proverb, does not profit by the quarrel.

If any legislation is needed, it is legislation to regulate the freight-charges of transportation companies. These companies get their right of way from the State. They are authorized to take private land in spite of the owner, at its appraised value; they enjoy many privileges, because they are supposed, as common carriers, to be a great public benefit. Yet all over the country, railroads are managed exclusively in the interest of private owners; and the company which by extorting the highest fares and freights, and operating most cheaply, declares the largest dividends, is called "the best managed." There should be a limit to this irresponsible tyranny of corporations; and nothing proves it more clearly than the manner in which the transportation companies of Pennsylvania have combined in their capacity of large coal-mining companies to prevent small collieries from working, by such an increase of freight charges as will stop the shipment of coal.

The argument that without this measure the operators could not successfully oppose the miners, is entirely impertinent. Even if it were true, the operators would have no right to interfere with any man's right to mine coal and send it to market. But it is not true; the hardships of this blockade fall chiefly on the innocent consumers in distant markets. The miners are not shivering for want of fuel; and the reckless measures of the operators are not likely to be any more successful than milder ones have been on former occasions.

Thus it will be seen that the overpaid miners attempt to perpetuate their gains at the expense of the wrong party; the operators attempt to conquer the miners by cruelty to the wrong party; and Congress tries to punish both by smiting the wrong party. Was there ever such a tragedy of errors?

The Tribune's Metallurgy.

THE *Tribune* keeps a metallurgist. If this had not been made sufficiently evident in its recent articles, the following astounding information in the issue of the 23d inst. will convince the most skeptical:—"Iron ore, taken from the Black Hills, near the highest level of the Union Pacific Railroad, has been smelted at Omaha, and found of excellent quality, *yielding eighty per cent. of superior metal.* Three hills of the ore lie near the railroad; and, as the material is at once most accessible and practically inexhaustible, the Union Pacific propose to use it in their smelting and casting shops, whose foreman (a Mr. FAWCETT) is said to have invented a new smelting furnace, which dispenses with the fan or blower, and (says the *Omaha Herald*), the new furnace is twenty-five feet high and five feet in circumference, tapering towards the top. About half way up is a circular steam supply-pipe, that introduces into the interior of the flue about a dozen jets of steam. This steam creates a vacuum that draws the blast through the live coal below with tremendous velocity, securing by such simple means the intense heat necessary for smelting the metal. The new furnace has been running now about two weeks, and is so great a success that several more are to be constructed, and the old furnaces entirely abandoned. This new process will reduce the cost of the smelting process to such an extent that an effort will be made to utilize the invention by smelting the ore of the Black Hills on the spot. With iron ore, coal and wood in abundance, and a largely decreased cost of maintaining the furnaces, there is no earthly reason why the pig-iron of the Black Hills cannot be made to compete with the iron imported into this State from the smelting furnaces in Missouri."

The italics are ours. Iron ores yielding *eighty* per cent. is pretty good, especially when we consider that magnetite, the richest form of iron ore, cannot possibly contain more than 72.4 per cent. of iron. We take the liberty of referring the strawberry metallurgist to any elementary manual of mineralogy for information on the per centage values of iron ores. After so remarkable an exhibition of mineralogical knowledge, it is not surprising that our metallurgist should swallow without comment the statements made in the *Omaha Herald.* But think of a furnace twenty-five feet high and *five feet in circumference and "tapering"* at that! That furnace might have to wear an overcoat to cast a shadow, but it would probably cast more shadow than iron.

It so happens that the steam jet arrangement was applied to cupola furnaces for the re-melting of pig-iron a year or two since in England; so it can hardly be considered an "invention" of Mr. FAWCETT's, unless its application to blast furnaces be an invention. We await anxiously further information in reference to this wonderful furnace, but above all things, we should like to see a specimen of that *eighty* per cent. ore.

Onondaga Salt.

FROM the annual report of the Superintendent of the Onondaga Salt springs we learn that during the year 1870 there were manufactured in the four districts, into which the salt springs reservation is divided, 8,748,113 bushels, of fifty-six pounds each, of salt. Of this amount nearly thirty per cent. were made by solar evaporation, and the remainder by artificial evaporation. The total revenue was $87,608.87 against $63,197.40 expenses. During the year several improvements of a permanent nature have been undertaken, but the cost of these is included in the expenses given above.

Since 1866 the amount of salt shipped to New York from Onondaga has been steadily on the increase. Last year it amounted to 2,033,125 bushels against 748,314 bushels in 1866. In 1860 foreign salt sold in the New York market for twenty-three cents per bushel in undepreciated currency, and in 1870 Onondaga salt was sold here for twenty cents in gold, and during the same time the total number of bushels imported has increased from fourteen to fifteen millions. Hence we see that though the price per bushel has been lowered, the amount imported has increased and the revenue of the government, from the import duty on salt, has been raised from $214,670 in 1860 to $1,300,000 in 1870.

We are informed that the excessively hot weather of last summer was very favorable for the production of solar salt, and while we record the fact with great pleasure, we cannot but hope the approaching summer may not be quite so favorable!

Formerly, pumping engines of sufficient capacity were con-

nected with several wells, but, since by this method the wells that gave the greatest amount of water were most likely to fill the pumps, the system has under the administration of Mr. GEDDES been abandoned, and as the old machinery gave out, each well was provided with a pump suited to its capacity. In this way each well may be made to yield the greatest possible amount of brine.

During the year a new well was sunk, about half a mile from the group of wells near the Syracuse pump-house. The well was located near the centre of paying salt ground in that locality, which consists of a strip of land about a mile long and perhaps half a mile wide. This well reached a depth of 368 feet, and on the first day of October was producing fifty gallons per minutes of the best brine yet produced in these salines. An analysis of this water by Dr. ENGLEHARDT, the chemist of the works, shows it to be of great purity, containing only 0.515 per cent. of sulphate of lime, very small quantities of the chlorides of calcium, magnesium, and peroxide of iron, and eighteen per cent. of chloride of sodium, or common salt.

In conclusion, the government comparative tests of foreign and Onondaga salts are given, the results showing that, of three hundred barrels of pork packed in New York, one half with foreign and the other with domestic salt, and sent to various military stations along the seaboard, and at the south and west, the universal testimony of the inspecting officers, after the pork had been kept for a considerable time, and after a careful comparison of the two samples, was in favor of that packed with domestic salt.

Water for Syracuse.

THE city of Syracuse is discussing the subject of water supply. A citizens' committee, coöperating with a committee of the Common Council, has caused careful surveys to be made, and has published the reports of Messrs. J. J. R. CROES and A. W. CRAVEN in a pamphlet, for a copy of which we are indebted to Mr. H. W. CLARKE, late City Surveyor of Syracuse, to whom credit for the preparation of the map is to be given.

The reports are unanimously in favor of procuring water from the Tully Lakes, four basins in the Tully valley, about twenty miles south of Syracuse. It is calculated that the mean daily flow from these lakes would exceed five million gallons, a quantity sufficient for a population of more than one hundred thousand. The contemplated works comprise a dam, conduits, a main reservoir of eleven acres, a distributing reservoir of six acres, and the necessary mains. The total estimated cost slightly exceeds a million dollars.

Besides the necessity for an increased supply, the city suffers, under existing circumstances, from the quality of the water now furnished, which contains large quantities of the carbonate and sulphate of lime. The Tully water, on the contrary, is purer than any other water in the vicinity of Syracuse, comparing favorably, indeed, with almost any other city supply in America. It is calculated that by the use of this soft water a saving would be effected by the present population of Syracuse of some $77,000 annually in the cost of soap, tea and coffee only; while the owners of steam boilers would save in fuel $48,000 per annum, the amount of their present loss through incrustations from lime water. To these considerations, fully set forth in the reports, we may add that of the public health. Many families in Syracuse have learned, by sad experience, the unwholesome character of the city water, and those who could afford it have long used for domestic purposes filtered rain water in its stead. The city could add to its present attractions as a place of residence, and to its present means of maintaining public health and public morals, no more effective agency than that of an abundant supply of pure, soft and wholesome water for all its inhabitants. If this is ever to be done, it is high time now. Every elevated lake, except those referred to, within twenty miles of Syracuse has already been seized by the State for canal purposes; and if action is delayed until this source of supply also is cut off, the flourishing "central city" may find itself suddenly cut short in its career of prosperous growth.

Compressed Air Railway Car.

By MR. J. K. FISHER.*

THE proposal of Mr. HORACE DAY to apply the system of working by compressed air, as practiced in the Mont Cenis Tunnel, to transfer power from water-falls to places at considerable distances, revives the old idea of using compressed air instead of steam for locomotion. Even if the general opinion be well founded, that steam directly applied is cheaper than steam applied to compress air into a reservoir on a locomotive, which air is to drive the locomotive, it still may be economical to work by compressed air, if part of the air can be compressed by a power cheaper than steam. If, on a route of 100 miles, three-quarters of the compressing stations can be supplied by water power that now runs to waste, and one-quarter must be supplied by steam, the aggregate cost may be less than that of steam locomotives for the whole route.

But in some cases the cost is not the governing consideration. On a tunnel railway the impurity of the air, which would be caused by steam locomotives, is a nuisance to be avoided, even at much extra cost for motive power. And even in open streets—it is apprehended by many—the gases and vapors from locomotives would be so unpleasant as to warrant the greater cost of indirect working by steam. I do not believe in this imagined offensiveness of steam from engines that burn good coke and keep their steam so dry as to be invisible, in all weathers when the breath of animals is invisible; but I am one of a minority, and I see that it is politic to propose what is second best, if that be necessary to avoid the objections of the majority. I therefore present the view that compressed air may be the best available motor for street railways. Though it be deemed much dearer than steam, it will, on full consideration, be deemed much cheaper than horse power, by a majority of engineers, and by those who have the prudence to decide by the evidence of experts, rather than to judge for themselves, without having sufficient knowledge of the subject.

But, as I before said, cost is not the chief consideration. Were compressed air considerably dearer than horse power, it still would be preferable, for several reasons. First, for its cleanliness: a car driven by it would make no dirt; but the horses of a street rail car make 199 pounds of dirt per day. Second, there is a degree of cruelty in wearing out horses in three years, which is painful to humane persons, and brutalizing to the thoughtless.

Sir JOSEPH WHITWORTH, with equal humanity and good taste, and with his well-known judgment as a mechanical engineer, thus spoke on these points in an address to the Association of Foremen Engineers: "The use of horse tramways is being urgently pressed forward, and a large outlay is contemplated. In my opinion they are not suited to the present times; and mechanical engineers have a right to enter their protest, considering the many obstructions there have been for many years past to the employment of road locomotives. If toll gates were abolished, and each county had an organized staff for making and keeping the roads, using the steam roller, steam sweeping machine, and other necessary appliances where there is large traffic, mechanical engineers would then, I have no doubt, soon produce a small light locomotive that would do its work quietly and most effectively. At the same time, pedestrians, and those who ride and drive, would have the great enjoyment of good and clean roads, instead of the badly paved and rough Macadam roads. The broken stones of the latter are left for the horses' feet and narrow wheels to consolidate, in a way which it is quite distressing to see. The consumption of fuel per horse power is now so small that road locomotives could be employed at far less expense than the over-worked and ill-conditioned horses we now see; while pedestrians, and those who keep horses for pleasure, would have good roads; and many gentlemen, no doubt, would have their well-made locomotives. Under any circumstances, good clean roads are the most profitable, when everything is taken into account."

To inflict on horses such suffering as they endure in city omnibus and railway service—to keep them in the loathsome air of their underground stables, and work them up to the extreme estimate of profit—is inexcusable at a time when engineers give such opinions as this. And to inflict such dirt on the public is an outrage that cannot be adequately condemned in language suitable for this place. And to endure such outrage is inconsistent with the popular conceit that people are capable of governing themselves. Do the people of this city endure it willingly? or because the politicians, for their own benefit, impose it upon them, or neglect to relieve them from it?

If, then, the majority object to steam, and doubt the cheapness of compressed air, it still is reasonable to claim that the avoidance of these evils is worth paying for at a cost greater than any estimate I have seen. But it is not admitted, by men who have experimented with compressed air, that it would cost more than steam; on the contrary, they claim that it would cost less, and have urged its use in locomotives. They claim that stationary engines, working with greater economy than locomotives, can compress air to drive them at less than the cost of the boilers, fuel, repairs and attendance, now adopted on railways. I have, on a committee of this club, joined in showing that a compressed air locomotive cannot run more than twenty miles with one charge of air, and is therefore unfit for common railway service; but for three-mile trips the case is different. I have carefully computed the weight of this plan, and compared it with the weight of a steam car; and it seems to me that it will be lighter than a steam car, and will run four or five miles with one charge. If it will do this, it will work as cheaply as steam on a short railway. Denying, then, the current affirmations that compressed air is too dear, and steam is somehow objectionable, I say that if these affirmations were true, it would still be advantageous to try them both, and adopt the best of the two.

But who will establish this old invention, whose patents expired before machine-shops could build it half as cheaply as it can now be built? Who will demonstrate, at a cost of five, or ten, or fifteen thousand dollars, to build one, or two, or three cars, that this invention is sound, while others are free to compete with him? NATHANIEL OGLE, when asked, by a committee of the Commons, a like question respecting steam carriages, said that if some gentleman should think well of the invention, and give twenty thousand pounds to promote it, and apply that money judiciously, he had no doubt the invention could be established, provided the tolls were made equal to those on horse carriages of equal capacity. So I say. If some gentleman, for the public good and his own fame, would take up this invention now, and build a car and try it, and find out its defects; and build another with improvements, and then another and another, with further improvements, he would, at less cost than would have been necessary in that early period in the locomotive art, show that the invention can work at less than the cost of horses, and be safe and agreeable to the public. And then, no doubt, the street railway companies would adopt them, and get them from the cheapest builders.

But it is not safe to depend on personal liberality to promote inventions, when we have patent laws for that purpose, even in cases in which those laws have failed of their intended effect. We must therefore seek for something patentable, to give a preference, if not a monopoly, to those who spend time and money to perfect the details and proportions, and excite a demand for such machines.

I have attempted, in this design of a city railway car, to devise an improvement, on which a patent can be founded. What I have done is, to modify the method of warming and heating the air. Other ways of heating it have been patented, by Mr. LEMUEL WRIGHT, whom we saw here at our discussion on the communications with Brooklyn; but I have some hope that my method will prove better than his, or any other that I have seen proposed. It consists in using compressed gas, which is jetted into the compressed air, on its way to the engines. It may be ignited by spongy platinum, or by electricity, or by a lamp kept burning in the combustion chamber. There are six air-holders, of thirty-seven cubic feet united capacity, which will hold 1850 feet of air when compressed to fifty times its ordinary density. To heat this air 300°, which I believe is about what is required to prevent freezing when the air expands to atmospheric pressure, will require eleven cubic feet of carburetted hydrogen. The cost may be three cents, but it should be much less, if there were a large demand for it; for this gas is a mere diluter of street gas, giving scarcely any light; and if the gas made in the early part of the process, when the true illuminating gases are not made in much quantity, were turned into a separate main, the amount of light supplied would not be much lessened. For a few experimental vehicles this gas would do; but where there are many, it may be expedient to make a cheaper kind of gas, such as was proposed at Berlin, two years ago. They were to make gas from lignite, at the mines; and to send it thirty miles through tubes, and sell it to the consumers at sixpence per 1000 feet. I do not know the heating powers of it; but it was computed that it would be cheaper than coal, for domestic heating. In tunnels, pure hydrogen will be required, because it makes no poisonous gas to contaminate the air.

It may be recollected that I proposed, in the discussion on Mr. DAY'S project, to use a cheap gas instead of air, to be compressed, and to ignite a part of it as it issues from the engines, and direct the flame against pipes through which the air or gas passes on its way to the engine. A small part of the compressed fluid may be gas, and the greater part air—one of the six vessels, filled with a mixture of gas and air, would give sufficient heat. But I think, after further examination, that the apparatus will be cheaper and lighter if made to burn the gas in the way shown in the drawing—that is, just as we burn it for lighting—in the air.

It will appear to some, as it appeared to me, that it will be difficult to control the flow of gas into the combustion chamber, so as to keep the jets lighted when the car stops to take up passengers. I think it can be done by a large chamber and jets, so contrived that the pressure in the gas reservoir shall be greater than in the air reservoirs. If not, there are other means, not necessary to discuss at this time.

I need not now discuss the main item of cost, the compression of the air. That has been practically treated, in England and here, and has been proclaimed successful, or, at least, not mechanically difficult. In Chicago and New Orleans, and on our famous elevated railway, it has been recently tried, with alleged success. It has been abandoned here, for what reason I have not heard. But the freezing, and the loss of power consequent on the loss of heat by compression, probably will always render impracticable the working of cars by compressed air, without some means of restoring part of the heat.

It may be required that I should assign my reasons for supposing that 300° of heat will restore the elasticity of the air compressed to fifty atmospheres. I confess that I am not able to give a satisfactory reason for it. I am not satisfied with the theories, and deductions from experiments, which I have found in the books; they do not accord with each other, or with appearances which I have witnessed. I therefore have ventured to take the analogy of steam. If you compress steam to fifty atmospheres pressure, you will raise its temperature 298°; and I think it safer to assume that air will confirm nearly to this law, than to trust to the imperfect experiments and theories I have seen recorded.

A brief comparison of the mechanical effects of heat, when applied to making and to superheating steam, may help to show the economy of heat applied as I propose.

To make a pound of steam, from water at 60°, at the usual locomotive pressure, requires 1170 units of heat. To superheat a pound of steam 490°, which doubles its volume, requires 233 units of heat. Thus, to double the power of the steam, requires a little less than a fifth of the heat required to make it. And it is nearly as economical to apply heat to air: RANKINE holds that equal quantities of heat will produce equal power, whatever elastic fluids they act upon.

It is further to be observed that there need be no waste of heat, when the gas is burnt *in* the air; whereas a third of the heat goes away in the smoke, in locomotives. Considered as a nuisance, in streets and in tunnels, the heat and foul gases, made in this way, would be scarcely perceptible; whereas in a continuous tunnel, such as is proposed here, the gases from a locomotive would be destructive to health. In the London underground railway, which is a third in open cuttings, the engines close their dampers in the tunnels, and do their firing in the cuttings; yet the gases in the tunnels have been much complained of.

Whether this method of heating compressed air, for this use, will give a sufficient commercial advantage to warrant an investment of money to establish what has been called compressed air locomotion, is a question which I should like to decide for others, if they would allow me; but as each will probably decide for himself, before he risks his money, I will not attempt to decide for him.

One thing, however, I will say, as a retort upon those who call it visionary to propose steam carriages, and who advocate the underground railway schemes that are now before the inexpert legislators at Albany, and urge that they be built, if not

(* Read before the Polytechnic Club of the American Institute, Jan. 26, 1871.)

by private capital alone, then by subsidies from the city. I say they are visionaries. I say that the Metropolitan railway, which they refer to as a profitable work, is unprofitable. I say that they have been guilty of culpable reticence, in not informing the public of this city of the true financial condition of that company: I have not seen in a New York journal a true report of its dividends, or the price of its stock, since the stock was selling at 130 or thereabout, and dividends of seven per cent. were made, mainly out of capital. On the contrary, a few days ago a leading promoter of these schemes in the Legislature told me that the stock of the Metropolitan was selling at 107, and a leading journal said the work was highly profitable: whereas the London *Economist* reports the stock at 66¼, and the last dividend at 3½. I should be glad to hear any one in this audience say if he has seen in any New York paper a quotation of this stock or its dividends at so low a rate. Nor have I seen in the English engineering journals any fair exposure of the deception founded on the early reports about this railway: those journals live on the engineering profession, and are silent about its errors, and loud in its praise. I do not imagine that they are bribed; nor do I imagine that the journals here are corruptly influenced; but there is in them a disinclination to report what may discourage capitalists from taking stock in these schemes, and an inclination to allow them to spend their money for the public good, without a reasonable chance of profit to themselves. Intelligent capitalists will not be caught; but speculators will puff and sell the stock to people of small means and great hopes, and it will be as bad for them as downright swindling could be. They will lose their money, if this scheme be carried out by private capital; and, unless the journals of this city are caluminators, there is likely to be immense robbery of the tax-payers, if they be carried out by help of city bonds, as is now urged by the West Side Association and by some of the journals.

Nor is the prototype of these schemes well planned for its present work; nor was it planned at all for this work. It was planned to bring one of the great railways into the heart of the city; and little was expected of it in the way of city passenger traffic. It would have been a signal blunder had it been designed for its present use; for it was so ill-suited to it that it had to be widened in some parts; and is still so ill-suited that the best engineering journal speculated about improvements on it that would involve almost a reconstruction. But, bad as it is, its imitations here are worse, since they are to be in a continuous tunnel, with no ventilation but through fourteen inch lamp-posts, or the areas under windows. Mr. ROBERT FAIRLIE, who is distinguished as the inventor of a duplex locomotive, being asked what he thought of these plans, said we had better go above ground.

I touch upon these schemes now, not to make them part of my subject, but to get them out of the way of better schemes; or, rather, to warn those who get their information from sources in this market, that they are being misinformed, and had better look to original sources for it.

As for street railways, I am, as I have been for many years, and as WHITWORTH is, of opinion that they are not suited to the present times; but they may be made better by putting on them steam cars, or air-cars, if they be preferred. Their average speed may be doubled, without making them more dangerous than they are now. And this would increase the average speed of the whole passenger traffic more than it can be increased by the tunnel lines proposed, while the surface traffic is by horse power. The key, and economical commencement of this improvement, is the introduction of locomotives on common roads, on which carriages will be independent of each other, and can run their whole trips without stopping.

In this paper I have used some language that may seem harsh. I used it for the purpose of provoking a discussion with some of the advocates of these schemes. I am ready to maintain these propositions:

1st, That railways with stations five-eighths of a mile apart are incapable of half the average speed attainable by the system I propose.

2d, That the horse is an unmitigated nuisance in cities: he is the direct and indirect cause of all the dirt in streets, and is the unsafest motor in use, and is intolerably slow, and has not the merit of cheapness to atone for these evils. Moreover, there cannot be good, cleanly and economical roads until horse-power is superseded. If persons of natural and somewhat barbarous tastes like horses, as they like dogs, and wish to use them for pleasure, I shall not contend with them, unless they oppose the use of steam, and the adaptation of roads to wheels. What I wish to discuss is the utilitarian question of carrying people who ride for business purposes. If any one is disposed to engage in *writing* a discussion, with a view to publish it, if it be satisfactorily written, I shall be glad to hear from him. And if any one is inclined to join in perfecting this invention, or in constructing it, I shall also be glad to hear from him.

The Determination of Sulphur in Cast-Iron.

By ARTHUR H. ELLIOTT.

MOST of the methods at present in use for determining the sulphur in cast-iron are worked so as ultimately to obtain the sulphur as sulphuric acid, and percipitate the latter as sulphate of barium. In some methods, this end is attained by treating the iron with acid, eliminating the sulphur as sulphuretted hydrogen, catching the latter in an alkaline solution of lead or zinc, and, after collecting the metallic sulphide formed, oxidising it by fusion or treatment with acids. In other methods, the sulphur is oxidised direct in the iron, without previous separation from the latter. There are many objections to these methods. In the first, the operation of fusing is well known to be a troublesome experiment; and, to add to the number of preliminary operations, the oxide of the metal soluble in alkalies, left in the solution of the fusion of the metallic sulphide, has to be separated previous to precipitating with chloride of barium. In the second case, of oxidising direct by treatment with acids, a tedious evaporation is incurred to separate silicic acid before precipitating with chloride of barium. Again, when a number of analyses have to be performed, the precipitating with chloride of barium becomes an operation it would be well to dispense with if possible.

To meet these objections, and place in the hands of chemists a ready, and, at the same time, accurate, method for the determination of sulphur in iron, I have devised and used the following process, which I find is expeditious and gives concordant results. It depends on the evolution of the sulphur as sulphuretted hydrogen, the absorption of the latter in solution of soda, and determination of sulphuretted hydrogen in the acidified soda solution with standard solution of iodine.

Preparation of the Standard Iodine Solution.—Dissolve about 5 grains of iodine, with about 7 grains of iodide of potassium, in 1000 c.c. of water. Now prepare a solution of hyposulphite of soda, containing about 25 grains of the salt, in 1000 c.c.; this is used to standardise the iodine by means of standard solution of bichromate of potash. The standard bichromate is made by dissolving 4·92 grains of the pure fused salt in 1000 c.c.; 1 c.c. of this solution is equal to 0·0127 of iodine. To find the value of the iodine solution, proceed thus: Take 20 c.c. of bichromate solution, add 10 c.c. of solution of iodide of potassium (1 in 10), and about 15 c.c. of hydrochloric acid 1 part of strong acid to 2 parts water). Now add from a burette the hyposulphite solution, till the solution in the beaker is greenish yellow; add to this a little clear starch-paste, and continue adding the hyposulphite till the blue color produced disappears, leaving a clear green solution. You will now have the value of the hyposulphite in terms of iodine. From this standardise the iodine solution, by taking 20 c.c. and adding the hyposulphite till one drop makes the solution colorless. The calculations are made as follows: Suppose 20 c.c. of bichromate are equal to 21·8 c.c. of hyposulphite, and 20 c.c. of iodine are equal to 7·6 c.c. of hyposulphite. Then, as 20 c.c. of bichromate are equal to 0·254 of iodine, 21·8 c.c. of hyposulphite are equal to 0·254 of iodine; therefore 1 c.c. of hyposulphite is equal to 0·01165 of iodine. As 7·6 c.c. of hyposulphite are equal to 20 c.c. of iodine solution, 20 c.c. of the iodine solution are equal to 0·08854 of iodine, therefore 1 c.c. is equal to 0·004427 of iodine. But, according to the following reaction, $H_2S+I_2=2HI+S$, I_2 is equal to S, or, 254 of iodine are equal ta 32 of sulphur. Therefore, by further calculation, 1 c.c. of iodine solution is equal to 0·000557 of sulphur.

The Process.—The apparatus used for dissolving the iron and catching the sulphuretted hydrogen formed is a narrow-necked flask, holding about 500 c.c.; a funnel-tube, with a bulb holding about 500 c.c., and provided with a glass tap. The exit-tube from the flask has its end ground obliquely, to allow the liquid condensing in it to drop back into the flask without stopping its passage; it is also provided with a bulb to catch the condensed liquid, and prevent its passing into the absorption-tube, which is about 10 centimetres long and 18 m.m. wide. It is provided with tubes, one passing to the bottom, the other an exit-tube. This tube is of thick glass, and is one of those usually sold to keep specimens. It is half filled with solution of soda, made by dissolving 1 part of the soda made from sodium in 5 parts of water; this solution does not use up any iodine after being acidified and mixed with starch-paste. A second tube, containing a strong solution of iodine in iodide of potasium, may be connected with the tube containing the soda, to absorb the phosphoretted hydrogen, which has a very disagreeable effect upon the operator.

Five grains of the finely-powdered drillings of iron are taken, and transferred to the flask by means of a piece of glazed paper. The paper containing the iron is coiled up so as to form a cylinder; it is then placed in the neck of the flask whilst the latter is held horizontally; the flask is then turned up vertically, and the iron allowed to fall in, retaining the paper with the finger; the last particles are removed from the paper by tapping the neck of the flask. After adjusting the cork containing the funnel-tube, and attaching the absorption-tube, 70 c.c. of dilute hydrochloric acid (1 part of strong acid to 2 parts of water) are poured into the bulb of the former, the glass tap being closed. A little acid is now allowed to enter the flask, and the contents of the latter are thoroughly mixed by shaking. When the action has abated, more acid is allowed to enter, the contents of the flask being mixed by shaking at each addition. When the iron is thoroughly decomposed, place a gentle flame uhder the flask, regulating the heat by the rate of bubbling through the absorption-tube. When the contents of the flask boil, keep boiling for some minutes, until they threaten to boil over. Now remove the lamp from under the flask, and, simultaneously, open the glass tap of the funnel-tube. Care should be taken that the tap works easily before beginning the experiment. Remove the absorption-tube from the rest of the apparatus, wash the contents into a beaker holding about 500 c.c., dilute with about 200 c.c. of boiled water,* acidify with hydrochloric acid, add a little clear starch-paste, and titrate with the standard solution of iodine till blue.

Phosphoretted hydrogen, which is also formed on treating the iron with acid, is not absorbed by solution of soda. I proved this before proceeding to work with the above process.

The following determinations were made by this method on two samples of iron:

A. Per cent. S.	B. Per cent. S.
0·136	0·077
0·120	0·072
0·136	0·080
0·119	0·076
0·130	0·085
	0·083
	0·081

* The reaction between the sulphuretted hydrogen and iodine cannot be depended on if the solution contains more than 0·04 per cent. of sulphuretted hydrogen.—BUNSEN.

When the solutions above mentioned are already prepared, this process will be found very expeditious. Having the standard solutions of brchromate and hyposulphite, it is easy to prepare a standard solution of iodine at any time. When once prepared, the solution of iodine keeps correct for months, if preserved in a dark bottle and in a cool place.

My sincere gratitude is due to Mr. VACHER for his kindness to me whilst pursuing these experiments in his laboratory.—*Chemical News.*

OFFICIAL LIST OF PATENTS.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEBRUARY 28, 1871.

Reported Officially for the Engineering and Mining Journal.

SCHEDULE OF PATENT OFFICE FEES

On each caveat	$10
On filing each application for a Patent (seventeen years)	15
On issuing each original Patent	20
On appeal to Commissioner of Patents	20
On application for Reissue	30
On application for Extension of Patent	50
On granting the Extension	50
On filing a Disclaimer	10
On an application for Design (three and a half years)	10
On an application for Design (seven years)	15
On an application for Design (fourteen years)	30
Registration fees for TRADE MARKS under the new law; for thirty years	25

Citizens of Canada can now obtain Patents in the United States upon the same terms as Citizens of other Countries.

For copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from upward, but usually at the price above named $1

The full Specifications of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them $1 25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case may be had by addressing

WESTERN & CO.,
No. 37 Park Row, New York.
CHARLES ROGERS, Solicitor.

112,104, antedated February 11, 1871.—TOY PROPELLER.—Arthur M. Allen, New York, N. Y.

112,105.—SAD AND CRIMPING-IRON.—Charles Anderson, Montana, Iowa.

112,106.—PYROMETER.—William Henry Bailey, Albion Works, Salford, Great Britain.

112,107.—WASHING-MACHINE.—William C. Bain and John J. Kendall, Troy's Store, N. C.

112,108.—WRENCH.—Elias Beach, Titusville, Pa.

112,109.—WRENCH.—Elias Beach, Titusville, Pa.

112,110.—WASHING-MACHINE.—Theophilus Beebe, Northport, N. Y.

112,111.—APPARATUS FOR CARBURETING AIR.—Alexander Dalrymple Bell, San Francisco, Cal.

112,112.—CHEESE-TURNING APPARATUS.—John Q. Black, Richland Centre, Wis.

112,113.—STRAW-CUTTER.—Bengt C. Blomsten, Waupaca, Wis.

112,114.—SAWING-MACHINE.—N. H. Bolton, Omro, Wis.

112,115.—DRILL.—Theodore V. Boyden, Bridgeport, Conn.

112,116.—ODOMETER.—David L. Branning, Tampa, Florida.

112,117.—FEED-CUTTER.—Henry A. Buck, Fredonia, N. Y.

112,118.—GRAIN-DRIER.—John Buckingham, Wethersfield, Conn.

112,119.—SELF-CENTERING CHUCK FOR LATHES.—George O. Buckley, New Bedford, Mass.

112,120.—APPARATUS FOR HEATING LIQUIDS.—David H. Burrell, Little Falls, N. Y.

112,121.—PROJECTILE FOR ORDNANCE.—John G. Butler, United States Army.

112,122.—HOT-AIR FURNACE.—Benjamin F. Campbell, Boston, Mass.

112,123.—DOOR KEY.—Charles C. Carpenter, Huntsville, Ala.

112,124.—GUN-SIGHT.—Frederick A. Churchill, Pittsfield, Mass.

112,125.—SHUTTLE FOR SEWING-MACHINES.—Theodore Colston, Hartford, Conn., assignor to himself and Charles E. Billings, same place.

112,126.—LAP-BOARD.—Daniel P. Cook, Hartford, Conn.

112,127.—MAGAZINE FIRE-ARM.—Joshua Davis, Limestoneville, Pa.

112,128.—WATER-WHEEL CURB.—Walter S. Davis, Warner, N. H.

112,129.—PRESERVING FISH BY FREEZING.—Samuel H. Davis and David W. Davis, Detroit, Mich.

112,130.—MEADOW CULTIVATOR.—Frank Philip Davenport, Carthage, Ill., assignor to himself, John W. Cherry, and Thomas Logan.

112,131.—CORN-HUSKING BENCH.—Joel E. Draper, Northville, assignor to himself and Robert Dunlap, 1st, South Lyons, Mich.

112,132.—COOKING STOVE.—Lemuel Dunham, Lincoln Centre, Me.

112,133.—PORTABLE FEED-RACK.—Edwin Farquhar, Aukenytown, Ohio.

112,134.—ATTACHING KNOBS TO THEIR SPINDLES.—William A. Fenn, Rochester, N. Y.

111,135.—TRACTION ENGINE.—George W. Fitts, Oberlin, Ohio.

112,136.—PRESERVING BLOCKS OF WOOD.—Edgar M. Fowler, New York, N. Y.

112,137.—LIGHTNING-ROD.—Joseph R. Fricke, Pittsburg, Pa.

112,138.—REVOLVING BATTERY GUN.—Richard Jordan Gatling, Indianapolis, Ind.

112,139.—BEE-HIVE.—Joseph H. Gisler, St. Louis, Mo.

112,140.—BALING SHORT-CUT HAY OR STRAW.—William Hadwin, Rochester, N. Y., assignor to himself and Isaac S. Wilson.

112,141.—GRAIN-SEPARATOR AND FANNING-MILL.—Samuel S. Hammond and John S. Paden, North East, Pa.

112,142.—EXTRACTOR FOR OIL WELLS.—Hart Harris, Tidioute, Pa.

112,143.—SCREW-DRIVER.—Henry L. Hildreth, Lockport, N. Y.

112,144.—PROJECTILE FOR ORDNANCE.—B. B. Hotchkiss, New York, N. Y.

112,145.—BELT-GEARING.—George C. Howard, Philadelphia, Pa.

112,146.—LAWN-MOWER.—Amer Ingraham, Philadelphia, Pa., assignor to William L. Boyer & Brother, same place.

112,147.—HARVESTER.—Isaac A. Johnson, Rockford, Ill., assignor to himself and Frederick H. Manny, same place.

112,148.—SHIPS' WINDLASS.—Christopher Coatsworth Jordeson, Montreal, Canada.

112,149.—HARROW AND FIELD ROLLER.—Abraham S. Keagy, Harristown, Ill.

112,150.—ANIMAL POKE.—Lewis Kelley, Saranac, Mich., assignor to himself and Joel Andrews, same place.

112,151.—STEAM AND WATER ENGINE.—Henry James King and Daniel Charles Mulock, Middletown, N. Y.

112,152.—STUBBLE ATTACHMENT FOR PLOWS.—Jesse Kinney, London, assignor to himself and Cyrus Kinney, Ingersoll, Canada.

112,153.—SEPARATING METAL FROM ORES.—Solomon W. Kirk, Philadelphia, Pa.

112,154.—COMPOSITION FOR POLISHING.—Carl J. H. F. Kleemann, New York, N. Y., assignor of one-half his right to Arnold C. Franck, same place.

111,155.—MACHINE FOR PATCHING, PUNCHING, AND EMBOSSING BUTTON-HOLES OF PAPER COLLARS.—Charles Lang, Jersey City, N. J., assignor of one-half his right to Henry G. Clagstone, New York City.

112,156.—SAWING-MACHINE.—George W. Lombard, Westminster, Mass.

112,157.—PUMP.—David Loomis, Joy Winters, and Albert Starr, Clyde, Ohio.

112,158.—SPRING BED BOTTOM.—Joseph E. Lord, Quincy, Ill.

112,159.—GOVERNOR FOR STEAM ENGINES.—John Augustus Lynch, Boston, Mass.

112,160.—URN FOR STOVES.—Orville F. Mack, Charlestown, Mass.

112,161.—CORN AND COTTON SCRAPER, &c.—Cyrus Marsh, 2d, Natchez, Miss.
112,162.—TREADLE FOR SEWING-MACHINES.—Francis E. Mills, San Francisco, Cal.
112,163.—EXPLOSIVE COMPOUND.—William E. Mills, New York, N. Y.
112,164.—PORTABLE FURNACE.—Dwight B. Montague, Springfield, Mass.
112,165.—PORTABLE BOOK-HOLDER.—Charles C. Moore, New York, N. Y.
112,166.—HARVESTER.—Daniel Mulock, Mount Hope, N. Y.
112,167.—WHEEL FOR VEHICLES.—Daniel Mulock, Mount Hope, N. Y.
112,168.—STAIR AND FLOOR-PLATE.—Peter W. Neefus, New York, N. Y.
112,169.—COMBINED COTTON-PLANTER AND GUANO-DISTRIBUTER.—John H. Nicholes, Sumter, S. C.
112,170.—STEAM ENGINE.—Powell F. Nickerson, Smyrna, Del.
112,171.—COTTON-PLANTER.—Rufus F. Norwood, Charlotte, N.C.
112,172.—CHANDELIER GAS-BURNER.—Rufus Nutting, Randolph, Vt
112,173.—FAUCET.—Cornelius B. O'Sullivan, New Orleans, La.
112,174.—GATE.—Charles N. Owen, Salem, Ohio.
112,175.—MATTRESS.—William H. Pack and Joseph S. Vanhorn, Jersey City, N. J.
112,176.—COUNTERSINK.—Frank H. Palmer, Foxcroft, Me.
112,177.—PUMP.—John S. Patric, Rochester, N. Y., assignor to Hiram Lawton, same place.
112,178.—STOVE-PIPE THIMBLE.—James D. Pierce, Milwaukee, Wis., assignor to himself and John B. Smith, same place.
112,179.—ADJUSTABLE ANIMAL POWER.—Nicholas Potter, East Troy, Pa.
112,180.—BALDRIC.—Virgil Price, New York, N. Y.
112,181.—METHOD OF COATING AND FINISHING SWORD-SCABBARDS.—Virgil Price, New York, N. Y.
112,182, antedated February 24, 1871.—LAMP-CHIMNEY.—James M. Rankin, Jr., Brooklyn, N. Y.
112,183.—VALVE FOR CONDENSERS.—George H. Reynolds, New York, N. Y., assignor to himself, Cornelius H. Delamater, and Alexander K. Rider, same place.
112,184.—SEWING-MACHINE TREADLE.—Leo W. Sapp, Cleveland, Ohio.
112,185.—BOTTLE-STOPPER.—Fredrich Schlich, New York, N. Y., assignor to himself and Adrian Feyh, same place.
112,186.—LUMBER WAGON.—Jacob Skeen, Mound City, Mo.
112,187.—GEARING AND UNGEARING PINIONS AND WHEELS.—John Skinner, Hadley, Mich.
112,188.—FIRE-PLACE.—John Smith, Brantford, Canada.
112,189.—SEWING-MACHINE.—William T. Smith, West Zanesville, Ohio, assignor to himself and William T. Maher, same place.
112,190.—VENTILATOR.—Daniel M. Sprogle and Joseph E. Dickson, Annapolis, Md.
112,191.—CORN-HARVESTER.—Clement Smith Stull, Poolesville, Md.
112,192.—TUYERE.—Peter Sweeny, New York, N. Y.
112,193.—FLEXIBLE FASTENING FOR GLASS.—Warren H. Taylor, Stamford, Conn.
112,194.—FENCE.—Jeremiah W. Teller and William Townsend, Lapeer, Mich.
112,195.—STEAM HEATER.—Walter Thomson, Detroit, Mich., assignor to "Detroit Novelty Works."
112,196.—HORSE COLLAR.—William J. Thorn, New York, N. Y.
112,197.—MACHINE FOR FELTING HAT BODIES.—Joseph Vero, Dewsbury near Leeds, England.
112,198.—FENCE.—John Waddle, Bakerstown, Pa.
112,199.—FIRE-PLACE.—Jerome W. Wetmore, Erie, Pa.
112,200.—MODE OF ATTACHING SPOKES TO WHEELS.—Jefferson G. Wiggins, Lima, N. Y., assignor to J. S. Gallatine, same place.
112,201.—MEDICAL COMPOUND OR LINIMENT.—Galen S. Wood, Vassalborough, Me.
112,202.—WATER-WHEEL.—Larnard M. Wright, Fort Edward, N. Y.
112,203.—JEWELERS' COMBINED CALIPERS AND POLISHING TOOL.—Francis E. Allen, Keene, N. H.
112,204.—TARGET ALARM.—Andreas Anderhub, New York, N. Y., assignor to John Bayer, same place.
111,205.—COOPERS' CROZE.—Vincent Applegate, Marline P. Jacobs, and Samuel F. Roby, Harrison County, Ind.
112,206.—BURNING HYDROCARBON LIQUID FOR LIGHT.—Thomas J. Barron, Brooklyn, E. D., N. Y.
112,207.—ELECTRICAL TICKET-CHECKING APPARATUS.—Marcus Bebro, Manchester, Great Britain.
112,208.—SAD-IRON HEATER.—George Benns, Rockford, Ill., assignor to Lucius M. West, same place.
112,209.—COMBINED COTTON-CHOPPER, SCRAPER, &c.—William C. Bibb, Madison, Ga.
112,210.—DOOR-CHECK.—Charles Bird, Lower Merion Township, assignor to himself, Charles S. Field, and T. P. Sargent, Philadelphia, Pa.
112,211.—KEYLESS PADLOCK.—Wilson Bohannan, Brooklyn, N. Y., assignor to American Seal Lock Company, New York City.
112,212.—SHOVEL-PLOW.—Francis H. Bowlds, Fairfield, Ky.
12,213.—TRITURATOR.—Elijah Brady, New York, N. Y.
2,214.—APPARATUS FOR LIFTING BARRELS, &c.—John S. Brewer, Chicago, Ill.
12,215.—STREET CAR.—Charles B. Broadwell, New Orleans, La., assignor to himself and Ignatius Caulfield, same place.
112,216.—STOP VALVE.—Sidney Broadbent and Willard B. Culver, Scranton, Pa.
112,217.—SHOWER-BATH APPARATUS.—Cyril P. Brown, Hudson, Mich.
112,218.—CARPENTERS' PLANE.—James Raymond Brown and William Brown, Boston, Mass.
112,219.—WATER-WHEEL.—Henry Bushnell, New Haven, Conn.
112,220.—APPARATUS FOR HEATING PROPAGATING BEDS.—William Chalmbers, Philadelphia, Pa.
112,221.—HEDGE-TRIMMER.—George Clark and Samuel P. Clark, Dover, assignors to themselves and Franklin B. Ives, Princeton, Ill.
112,222.—STEAM SAFETY-VALVE.—Gilbert H. Clemens, Chicago, Ill.
112,223.—BINDER FOR SEWING-MACHINES.—Jacob L. Coles, Newark, N. J., assignor to himself and James W. Corey, same place.
112,224.—BALING-PRESS.—Thomas J. Corning, San Jose, Cal.
112,225.—SHUTTER-FASTENER.—Jonathan L. Devol, Parkersburg, W. Va.
112,226.—FERMENTATION AND PURIFICATION OF ORGANIC SUBSTANCES.—Rudolph D'Heureuse, New York, N. Y.
112,227.—SAW.—Henry Disston, Philadelphia, Pa.
112,228.—MORTISING MACHINE.—William Downing and William H. Soley, Philadelphia, Pa., assignors to Westford Warner, same place.
112,229.—RAILWAY-CAR SPRING.—Richard Dudley and Benjamin Hershey, Erie, Pa.
112,230.—OPERATING ORDNANCE.—James B. Eads, St. Louis, Mo.
112,231.—LOZENGE-CUTTING MACHINE.—Winslow P. Eayrs, Nashua, N. H.
112,232.—APPARATUS FOR TANNING.—Lewis C. England, Philadelphia, Pa.
112,233.—HEATING APPARATUS.—Michel G. Fagan, Troy, N. Y., assignor to himself and Albert C. Corse, same place.
112,234.—PLOW.—John B. Ferguson and Samuel M. White, Big Lick, Va.
112,235.—CLOTHES-RUBBER.—Seymour Foster, Lansing, Mich.
112,236.—MODE OF FASTENING HARROW-TEETH.—George Fry, Newaygo, Mich.
112,237.—NECK-TIE RETAINER.—Eli B. Gibbud, Waterbury, Conn., assignor to himself and Benjamin H. Bradley, same place; said Gibbud and Bradley assignors to John Bachelder, Norwich, Conn.
112,238, antedated February 22, 1871.—WRENCH AND OILER.—Edwin B. Gifford, Westport, Mass.
112,239.—WOODEN PAVEMENT.—Jackson Grant, Milwaukee, Wis.
112,240.—SPOON.—Florian Grosjean, Brooklyn, N. Y.
112,241.—STRAW-CUTTER.—Phillip Peter Gross, Palmyra, Mo.
112,242.—ELECTRO-MAGNETIC SIGNAL APPARATUS.—Augustus Hahl, Washington, D. C., assignor to "The Electric Clock and Bell Company," same place.
112,243.—BEE-HIVE.—William S. Harned and Frank S. Elliott, Boonesborough, Iowa.
112,244, antedated February 17, 1871.—LADIES' SUPPORTING BRACE.—Marx Harris, New York, N. Y.
112,245.—GUIDE FOR SEWING-MACHINES.—Franz Herterich, Jersey City, N. J.
112,246.—GRATE FOR BURNING COAL-SCREENINGS.—George W. Hildreth, Lockport, N. Y.
112,247.—ANCHOR.—William M. Hughes, San Francisco, Cal.
112,248.—BOLT-HEADING MACHINE.—Thomas Hull and Nicholas Thomas, Chicago, Ill.
112,249.—PRINTING PRESS.—George Washington Hunt, New York, N. Y., assignor to himself, George Place, and Charles F. Hardwick, same place.
112,250.—FLOOD-FENCE.—Charles R. Hunter, Douglas, Ill.
112,251.—HORSE-POWER.—James W. Huntoon, St. Louis, Mo.
112,252.—WAGON-BRAKE.—Reuben Hurd, Morrison, Ill.
112,253.—MACHINE FOR WARPING YARN.—Daniel Hussey, Lowell, Mass.
112,254.—ROCK-DRILL.—Simon Ingersoll, Brooklyn, N. Y.
112,255.—METHOD OF FORMING SPUR-LIP OF AUGER BITS.—William A. Ives, New Haven, Conn.
112,256, antedated February 23, 1871.—WATER INDICATOR.—Hiram Kimball, Randolph, Vt.
112,257.—HEAD-BLOCK FOR SAW-MILLS.—William A. L. Kirk, Hamilton, Ohio.
112,258.—CHEST PROTECTOR.—Peter Lear, Boston, Mass.
112,259.—SOAP COMPOUND.—Henry Loos, Lawrence, Kansas.
112,260.—STOVE PIPE DAMPER.—William H. Lutz, Lancaster, Pa., assignor to himself and William Boas, same place.
112,261.—LATH MACHINE.—John C. Mackay, Ionia, Mich.
112,262.—BEE HIVE.—Gideon Marsh, Steamburg, N. Y.
112,263.—HARVESTER.—James S. Marsh, Lewisburg, Pa.
112,264.—PAPER-FOLDING MACHINE.—John McAdams, Brooklyn, N. Y.
112,265.—FEED-CUTTER.—James B. McClinton and William McClinton, Galion, Ohio.
112,266.—TEA-KETTLE.—Charles W. McClure and William A. Shepard, Wooster, Ohio.
112,267.—COMBINED HARVESTER AND BINDERS.—John M. McKesson, Lincoln, Nebraska.
112,268.—SASH-HOLDER.—Joseph W. Megaw, Wilmington, Del.
112,269.—DEVICE FOR TRANSMITTING AND REVERSING ROTARY MOTION.—William Henry Merrick, Philadelphia, Pa.
112,270.—APPARATUS FOR USING ELECTRICITY AS A REMEDIAL AGENT.—George Munro, Philadelphia, Pa.
112,271.—CRADLE.—Richard W. Myers, Glen Gardner Station (Clarksville Post Office), N. J.
112,272.—SPOOL SHOW-CASE.—Richard H. Norris, Paterson, N.J.
112,273.—COUPLING FOR PLOWS.—George Owen, Jacksonville, Ill.
112,274.—CASE-SHOT.—Seth White Paine, Williamsport, Pa.
112,275.—WASH-BOILER.—Thomas U. Parker, Mifflintown, Pa.
112,276.—FIRE-ESCAPE LADDER.—William B. Peregoy, Baltimore, Md.
112,277.—SHOW-CASE FOR SPOOL-THREADS.—Alexander C. Phil- Chicago, Ill.
112,278.—LOCKING DEVICE FOR WINDOW CORDS.—Charles R. Rand, Dubuque, Iowa.
112,279.—SPOKE AND FELLY MACHINE.—David Reed and Thomas E. Pierce, Sullivan, Ind.
112,280.—NAIL MACHINE.—Henry Reese, Baltimore, Md.
112,281.—INSULATOR FOR TELEGRAPH WIRES.—Zenas C. Robbins, Washington, D. C.
112,282.—SAD AND FLUTING IRON.—William D. Robertson, Knoxville, Tenn.
112,283.—SAFETY PLUG ATTACHMENT TO STEAM BOILERS.—Andrew Robes, Somerville, and John C. Chapman, Cambridgeport, Mass.
112,284.—ICE MACHINE.—Adolphe Rock, Boston, Mass.
112,285.—PROCESS AND APPARATUS FOR CURING HIDES.—Adolphe Rock, New Orleans, La.
112,286.—MODE OF MOLDING AND CASTING PIPE ELBOWS.—George Rees, Newport, Ky.
112,287.—SELF-LOADING SCRAPER.—Ansell P. Routt and John J. Keeton, Liberty Mills, Va.
112,288.—HARVESTER.—Jacobs W. Schuckers, Philadelphia, Pa., assignor to Jonathan W. Grubb, same place.
112,289.—HARVESTER-RAKE.—Francis B. Scott, Lancaster, N.Y.
112,290.—STOVE PIPE SHELF.—Jerome D. Scott, Friendship, N. Y.
112,291.—VAPOR-BURNER.—James Shay, Cincinnati, Ohio.
112,292.—NUMBERING AND PAGING MACHINE.—Alpheus C. Sine, Cincinnati, Ohio.
112,293.—AUTOMATIC FAN.—Charles Bridges Smith, Griffin, Ga.
112,294.—COOLING, FREEZING, AND PRESERVING SOLIDS, LIQUIDS, AND GASES.—Daniel E. Somes, Washington, D. C.
112,295.—RUBBER TIRE FOR STEAM CARRIAGES.—Louis Sterne, London, England.
112,296.—SAW-JOINTER FOR CIRCULAR SAWS.—John H. Stevenson, Birmingham, Ohio.
112,297.—WASHING-MACHINE.—John Taylor, Philadelphia, Pa.
112,298.—STEAM AND HYDRAULIC PRESS.—John F. Taylor, Charleston, S. C.
112,299.—GRAIN DRILL.—John H. Thomas, Springfield, Ohio, assignor to himself and Phineas P. Mast, same place.
112,300, antedated February 18, 1871.—HEDGE-TRIMMER.—James M. Vannosdall and Oliver Vannosdall, Newark, Ill.
112,301.—CONSTRUCTION OF WOODEN BOXES.—William F. Veber, Perrysburg, Ohio, assignor to S. P. Tolman and C. C. Roberts, same place.
112,302.—PLOW.—Harvy Washburn, Pultney, N. Y.
112,303, antedated February 25, 1871.—CLOTHES-PIN.—Hiram J. Wattles, Rockford, Ill.
112,304.—FRUIT PRESS.—Gabriel J. Wells, South Vineland, N. J., assignor to John W. Snyder.
112,305.—CARTRIDGE.—Rollin White, Lowell, Mass.
112,306.—PAPER BOX.—John Warren Wilcox, New York, N. Y.
112,307.—UMBRELLA.—James Willis, Stockbridge Works, near Sheffield, England.
112,308.—SEWING MACHINE.—William C. Winters, Rochester, N. Y.

REISSUES.

4,277.—HAT.—John P. Beatty, Norwalk, Conn.—Patent No. 88,116, dated March 23, 1869; antedated February 2, 1869; reissue No. 3,855, dated March 1, 1870.
4,278.—GLOVE.—Remus D. Burr, Kingsborough, N.Y.—Patent No. 80,707, dated August 4, 1868.
4,279.—STEAM ENGINE.—Philip Estes, Leavenworth, Kansas.—Patent No. 108,576, dated October 25, 1870.
4,280.—FOLDING CHAIR.—Francis March Holmes, Boston, Mass.—Patedt No. 111,455, dated January 31, 1871.
4,281.—HARVESTER.—Henry F. Mann, Pittsburg, Pa., for himself and as assignee of Jacob J. Mann.—Patent No. 15,044, dated June 3, 1856; extended seven years.
4,282.—BREAST PUMP.—4,283.—Morris Mattson, New York, N. Y.—Patent No. 85,318, dated December 29, 1868.
4,283.—LOCK NUT—John Miller, Jr., Marshalltown, Iowa.—Patent No. 106,927, dated November 1, 1870.
4,284.—LAMP.—Albert H. North, Hartford, Conn., assignor to Rufus S. Merrill; said Merrill assigns two-thirds of his right to William B. Merrill and Joshua Merrill, Boston, Mass.—Patent No. 23,483, dated April 5, 1859.
4,285.—SPRING FOR BEDS, &c.—Charles Rich, Poughkeepsie, N. Y., assignor to the Metallic Union Spring Company, same place.—Patent No. 106,980, dated August 30, 1870.
4,286.—MODE OF SECURING SPRINGS IN UPHOLSTERY.—Wendell Wright, New York, N. Y.—Patent No. 16,254, dated December 16, 1856; extended seven years.

DESIGNS.

4,676.—SCREEN.—William N. Bartholomew, Newton Centre, Mass.
4,677.—DRAWER-PULL.—Pietro Cinquini, West Meriden, assignor to Parker & Whipple Company.
4,678.—DRAWER-PULL.—Patrick J. Clark, West Meriden, Conn.
4,679.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Stewart, same place.
4,680.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Stewart, same place.
4,681.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Stewart, same place.
4,682.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Stewart, same place.
4,683.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Stewart, same place.
4,684.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Stewart, same place.
4,685.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Stewart, same place.
4,686.—STOCKING FABRIC.—Thomas Dolan, Philadelphia, Pa.
4,687.—WINDOW-SASH HOLDER.—Cassius M. Drury, Granby, N. Y.
4,688.—BED-QUILT.—Frederick William Eger and Henry H. Kunze, Philadelphia, Pa.
4,689.—SUGAR BOWL, &c.—John H. Hobbs, Wheeling, W. Va.
4,690.—SCHOOL SEAT—William H. Joeckel, New York, N. Y.
4,691.—OIL-CLOTH PATTERN.—Henry Kagy, Philadelphia, Pa., assignor to Thomas Potter, Son & Co.
4,692.—WINDOW-FASTENER.—William Nelson, Anderson, Ind.
4,693.—REFLECTOR.—August Wilhelm, Philadelphia, Pa.

TRADE-MARKS.

175.—GLUE.—Baeder, Adamson & Co., Philadelphia, Pa.
176.—BEER.—Benjamin Bates, Baltimore, Md.
177.—CHICCORY.—Blume & Co., New York. N. Y.
178.—LOCKS AND HARDWARE.—Hillebrand & Wolf, Philadelphia, Pa.
179.—SHIRT.—Lewis Levi, New York, N. Y.
180.—WHISKY.—Vidvard & Sheehan, Utica, N. Y.
181.—SEWING-MACHINE.—Wheeler & Wilson Manufacturing Company, Bridgeport, Conn.

BUSINESS AND PERSONAL.

[Short notices in this column fifty cents per line each insertion.]

GLYNN'S ANTI-INCRUSTATOR FOR STEAM BOILERS.—THE only and reliable article for removing and preventing incrustation. No foaming, and does not attack metals of boiler. Liberal terms to agents. C. D. FREDRICKS, 587 Broadway, N. Y.
April 19 tf

IMPORTANT TO INVENTORS.

WESTERN AND CO.'S PATENT AGENCY.
CHARLES ROGERS, Solicitor and Manager.

In connection with the publication of the ENGINEERING and MINING JOURNAL and the MANUFACTURER AND BUILDER, we have frequently received applications from subscribers and patrons to act as their agents in transacting business with the United States Patent Office; and in view of the increasing number and urgency of such requests, we have resolved to add this department to our business. We have accordingly organized

A COMPLETE PATENT AGENCY,

and now offer our services in procuring patents in this and foreign countries, and transacting all business relating to the obtaining of patents.

OUR CHARGES.

Our charges are as moderate as those of any other responsible patent attorneys, as will be seen from the following figures: For preparing a case (whether simple or complicated) and attending to its passage through the Patent Office, our fee is from $30 to $40, which includes all the necessary papers and drawings. If the application is rejected we make no further charge, but prepare all necessary amendments, and, if requisite, appeal to the Board of Examiners-in-Chief. Most Patent Attorneys make an additional charge on each adverse action of the Patent Office, but we have found it more satisfactory to all parties interested to make our full charge at first; and as we expect no contingent fees, it is to our interest to prepare our cases properly at the commencement, thus avoiding annoyance to ourselves and delay in getting out the patent.

The cost of getting out a patent through our agency is—
For first Government fee, stamp, etc..... $16
" our fee..... $30 to 40
" final Government fee..... 20
Total..... $66 to $76

If the case has to be appealed, the applicant pays the Government fee on appeal, $10; but we shall ordinarily make no additional charge for our services. The first two items are payable when the application is sent in, and the second Government fee when a patent has been allowed. Before an appeal is taken, in any case, the applicant will be fully advised of all facts and charges, and no proceedings had without his sanction; so that all inventors who employ our agency will know in advance what their applications and patents are to cost.

For Rejected Applications prepared by others, our charges vary somewhat according to the nature of the case, but are generally as follows:
In advance, on receiving the case..... $10
When the patent is allowed..... $20 to 30
Total..... $30 to $40
the applicant paying such Government fees as may be required.

For preparing and filling a Caveat,
Our fee is..... $15
Government fee..... 10
Total..... $25

For attending to the obtaining of Reissues, Extensions, etc. and preparing Assignments, our charges vary according to the labor involved.

We are possessed of all the facilities for the successful prosecution of applications for patents in Great Britain, France, Belgium, and other foreign countries, on favorable terms.

Inventors who reside out of New York, and wish to procure a patent, need not go to the expense of visiting this city or Washington, but may send us a model of their invention, or a sketch and brief description; this will enable us to decide as to its probable novelty and patentability, and we can proceed at once to prosecute the case. We shall, however, be glad at all times to see our friends from any section, and give them such information as we are possessed of relating to patents, free of charge. A Post-office order for $16, to pay the first Government fee and stamp duty, should be sent along with the model; our fee $30 to $40, being payable as soon as the application is ready to be sent to Washington.

Patents granted through this agency will be described and illustrated in the columns of the ENGINEERING AND MINING JOURNAL or the MANUFACTURER AND BUILDER, without further charge to the inventor than the cost of the necessary cuts.

All communications to be addressed to

WESTERN & COMPANY,
P. O. Box, 5969. 37 PARK ROW, NEW YORK.

Advertisements.

The special advantages of the ENGINEERING AND MINING JOURNAL, *as a medium for advertisers, are so great and so widely known that it may seem almost needless to call attention to them. It is extensively circulated among the engineers of the country and takes a position in this respect before any other publication of the kind. It has a large and constantly increasing circulation among miners and mine owners, and men connected with mining operations generally. As it is the only paper in the country that makes this subject a specialty it has this field entirely to itself, and is the only direct and reliable means of reaching this class of persons. Being kept on file by almost every subscriber, it is doubly valuable as a permanent means of keeping an advertisement before the public. It is the recognized organ of the coal trade, and is taken extensively by the trade throughout the country and presents the very best means of reaching that very important class of men.*

Rates of Advertising.

The rate of advertising, compared with those of other weekly industrial publications, are very low, especially when the class of consumers among which its large circulation is almost entirely confined, is taken into consideration.

Back Page.....40 cents a line.
Inside Pages.....35 cents a line.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

MISCELLANEOUS.

Facts for the Ladies.—John Sibley deposed: I must declare the Wheeler & Wilson to be the most wonderful and comprehensive sewing mechanism ever put in the American market. It is the simplest as well as the most cunning in principle. There is genius and high mechanical ability in its arrangement, and therefore it is most reliable and easy to keep in order. There is a directness of connection between the power and the result, never found by me in the devices of any other inventor, and the mechanical results follow of the highest possible speed, quiet and easy movement, which make it a delight to mechanicians. I think it just to denominate it one of the marvels of the age.

THE CHALMERS-SPENCE PATENT NON-CONDUCTOR CO.

ST. LOUIS BRANCH,
1202 & 1204 N. Second street.

Never deteriorates. Saves 20 per cent. Keeps steam perfectly dry. Twenty of the largest Mississippi boats have their boilers, pipes, etc., covered with this invaluable material. T. CHALMERS, Manager.
J. B. ROACH, Treasurer.

CUMBERLAND COAL,
MINED BY THE
CONSOLIDATION COAL COMPANY,
Of the best quality for manufacturing, steam generating, and domestic purposes.
Orders received by the Cargo at
New York Office, 71 Broadway.
New England Agency,
STEVENSON & PEIRSON,
48 Kilby street, Boston.
Baltimore and Georgetown Agency,
G. MEREDITH, South Gay street,
Mch 7 tf Baltimore.

DIAMONDS AND CARBON furnished and set for drilling rock, sawing or working stone, also *Glazier's Diamonds*. See ENGINEERING AND MINING JOURNAL, January 17, 1871, for further particulars.
Address: JOHN DICKINSON, 64 Nassau st., N. Y.
3mo

WILLIAM R. TAYLOR,
Kings County Steam Boiler-Works,
MANUFACTURER OF
High and Low-Pressure Steam Boilers.
ALSO,
TAYLOR'S PATENT UPRIGHT RETURN TUBULAR BOILERS,
TANKS, GASOMETERS, SUGAR PANS, COOLERS,
OIL-STILLS AND OIL-TANKS.
ALSO,
ANDERSON'S Improved Machine for
GRINDING SEATS OF VALVES.
Nos. 345 and 347 First Street,
(Old Nos. 277 and 279,
Near North-Fourth, (P. O. BOX 213.) Brooklyn, E. D.
J. M. RING, Sole Agent, 265 Broadway, New York.
☞ Special attention given to repairs. dec6-6m

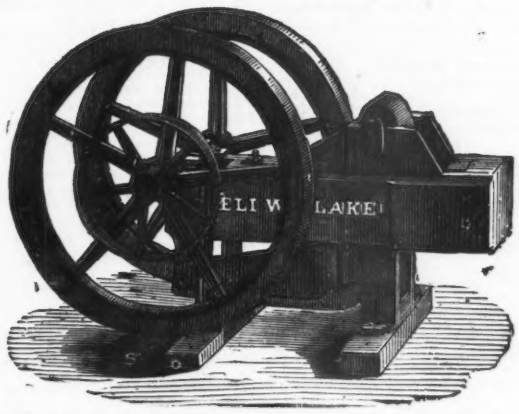
SAMUEL BONNELL, JR., OFFERS FOR SALE his SUGAR CREEK and HONEY BROOK
LEHIGH COALS,
OFFICE:
43 and 45 TRINITY BUILDING, 111 BROADWAY,
NEW YORK. Jan:1y

WILLIAM F. McNAMARA,
SOLICITOR OF PATENTS
AND COUNSELLOR-AT-LAW.
No. 37 PARK ROW, NEW YORK, ROOM 22.
Advice in Patent Law given free. mar 8:tf

LADIES DESIRING TO PROCURE A first-class Sewing Machine against easy monthly instalments or work, may apply to 294 Bowery, New York. Sept.20-6m

MISCELLANEOUS.

BLAKE'S STONE BREAKER.



The office of this Machine is to break Ores and Minerals of every kind into small fragments, preparatory to their further comminution by other machinery.

This machine has now been in use, enduring the severest tests, for the last ten years, during which time it has been introduced into almost every country on the globe, and is everywhere received with great and increasing favor as a labor-saving machine of the first order.

Illustrated circulars, fully describing the machine, with ample testimonials to its efficiency and utility, will be furnished on application, by letter to the undersigned.

☞ The Patents obtained for this machine in the United States and in England having been fully sustained by the courts, after well contested suits in both countries, all persons are hereby cautioned not to violate them; and they are informed that every machine now in use or offered for sale, not made by us, in which the ores are crushed between upright convergent faces or jaws actuated by a revolving shaft and fly-wheel, are made and used in violation of our patent.

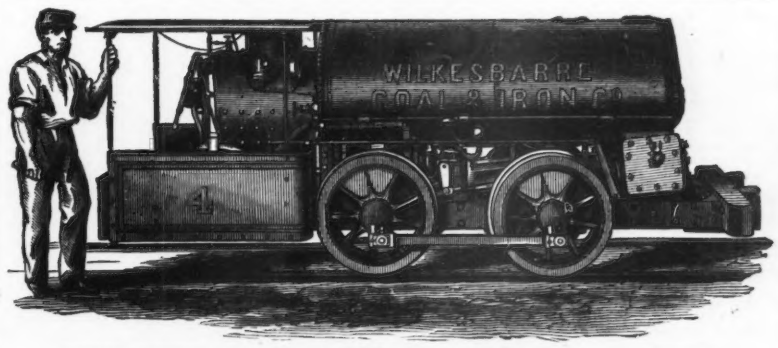
Mch. 14-1y. BLAKE BROTHERS, New Haven, Conn.

JOHN A. GRISWOLD, ERASTUS CORNING. ERASTUS CORNING, JR., CHESTER GRISWOLD.

JOHN A. GRISWOLD & CO.,
PROPRIETORS OF THE
RENSSELAER IRON WORKS,
TROY, N. Y.
Bessemer Steel Works, Fort Edward Blast Furnace and Columbia Blast Furnace
MANUFACTURERS of PIG IRON, RAILROAD, MERCHANT AND SHIP IRON,
Bessemer Steel Rails, Axles, Tyres, Shafting Plates and Steel Forgings,
OF ALL DESCRIPTIONS.
Office in New York, No. 56 Broadway.
May 17:1y

NEW JERSEY ZINC COMPANY.
B. S. GIBLIN, Treasurer. GEORGE A. BELL, President
WORKS NEWARK, N. J., OFFICE No. 61 MAIDEN LANE NEW YORK.
Franklinite Pig Iron (Spiegeleisen), Spelter, Oxide of Zinc, Spiegeleisen Cinder for Blast Furnaces.
May 24:1y

LEHIGH ZINC COMPANY.
GORDON MONGES, Treasurer. B. C. WEBSTER, President.
WORKS, BETHLEHEM, PA. OFFICE, 333 Walnut Street, Philadelphia.
JOHN JEWETT & SONS, AGENTS, 182 FRONT STREET, NEW YORK.
OXIDE OF ZINC, SPELTER, SHEET ZINC.
Jun28:1y



IMPROVED DIRECT-ACTING MINING LOCOMOTIVE.
Gauge, two feet six inches or upwards; Hight above rail, five feet four inches; Width over all, five feet one inch; Adapted to burn Anthracite or Bituminous coal or coke.

Materials and Workmanship Equal to those in Full Gauge Railroad Locomotives.

Guaranteed to pass curves of twenty-five feet radius and haul on a level track in good condition
Three Hundred and Forty Gross Tons of Cars and Load.
For Photograph and full particulars, address M. BAIRD & CO.,
Feb:7:1y:eow Baldwin Locomotive Works, Philadelphia.

AVELING & PORTER'S
NEW PATENT ROAD LOCOMOTIVES
ARE OF UNUSUAL LIGHTNESS, SIMPLICITY, AND POWER,
AND ARE
DRIVEN AND STEERED BY ONE MAN.

They are made from 4½ to 8½ tons in weight and will haul as great a load *with the same weight of Engine* on any roadway as Traction Engines fitted with Rubber Tyres. Their cost for wear and tear *is less*, their first cost is *thirty per cent less*, and their daily working expenses are *not so great by one third*. Fixed and movable machinery can be driven by these Engines without extra cost for fitting them.

Aveling & Porter manufacturers, Rochester, England. Agent for the United States, W. CHURCHILL OASTLER, 43 Exchange Place, New York.

Tramway Engines for mines etc., Steam-ploughs, Steam Road Rollers, light and heavy Agricultural Locomotives, Portable Engines, Road locomotives with India Rubber Tyres, etc. oct.11.6m

P. H. VAN DER WEYDE, M. D.,
(Late Professor of the N. Y. Medical College, of Mechanics, etc., at the Cooper Institute, and of Industrial Science at the Girard College, Philadelphia.)
Analytical & Consulting Chemist and Engineer.
887 Pacific avenue, above Grand avenue, Brooklyn
Office ENGINEERING AND MINING JOURNAL, 37 Park Row
New York City. jan30tf

R. P. ROTHWELL,
MINING AND CIVIL ENGINEER
AND METALLURGIST,
From the Imperial School of Mines, Paris, member of the Geological Society of France, etc,
OFFICE, WILKESBARRE, PA.
Having had a large practical experience in Europe and this country, is prepared to examine and report on all kinds of mineral property, superintend mines, and metallurgical works, assay ores, etc. 18-2-qp

1871.
"THE ENGINEERING AND MINING JOURNAL."
AN ILLUSTRATED WEEKLY PERIODICAL,
Intended to advance the interests of those engaged in
ENGINEERING AND MINING, in the
widest sense of those terms.

VOLUME X. COMMENCED JAN 4.

ENGINEERING.

It contains matter of the highest importance to all who are engaged in

CIVIL ENGINEERING, as in the erection of buildings the construction of industrial works, public and private, the surveying and laying out of roads, canals, railroads, etc., and the erection of bridges, docks, etc. Being the recognized official organ of the American Institute of Architects, the various papers on subjects connected with building, which are from time to time read before the Institute, will be published in its columns.

MECHANICAL ENGINEERING, as steam engines, hydraulic motors, the construction of tools, machinery, mill-work, etc.

AGRICULTURAL ENGINEERING, as the application of machinery to agricultural processes, and the improvement of agricultural districts by drainage, and various other operations involving an acquaintance with engineering practices.

HYDRAULIC ENGINEERING, as in the planning and construction of water-works, and the improvement of rivers, harbors, etc.

MINING is a subject that receives equal attention with Engineering. The various interests involved in the mining operations of the country, as

THE COAL TRADE,
THE METAL TRADE,
and MARKET REPORTS,

wherever they affect these subjects, are fully cared for, while the principles which relate to mining, geology mineralogy, chemistry, and metallurgy are carefully elaborated, and all new discoveries relating there promptly detailed. In the practical departments relating to the working and management of mines, whether of gold, silver, copper, lead, iron, coal, slate, marble, stone, oil, salt, etc., will be found, not only the latest news, but a full discussion of the best methods of developing these important interests and bringing their products into marketable shape.

The ENGINEERING AND MINING JOURNAL is not strictly a new periodical, as for nearly four years it has occupied a prominent position in the field of journalism under the title, THE AMERICAN JOURNAL OF MINING, which is now presented re-modeled, improved, and in a new and more attractive form.

CONTRIBUTORS.

Among its Contributors will be found some of the ablest men of the day, and no effort or expense will be spared to make the information conveyed, FRESH, TRUSTWORTHY, AND THOROUGH.

ILLUSTRATIONS.

Subjects requiring the aid of engravings will be fully illustrated by cuts prepared by the best artists. Great pains will be taken in this department.

SUBSCRIPTION.

Subscription price $4 per annum, in advance. Any person sending us the names of four subscribers, with the full subscription rate, $16, will receive an extra copy free.

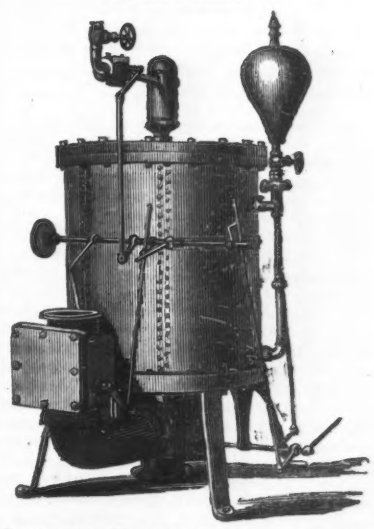
SINGLE COPIES, TEN CENTS EACH.

☞ Specimen Copies sent free on application to the Publishers. Address,

WESTERN & COMPANY,
P. O. Box 5969. 37 Park Row.

News Dealers supplied by the *American News Company* 121 Nassau St., New York.

PATENT AUTOMATIC STEAM VACUUM PUMP.



For City Water-Works, Mines, Railroads, Steamships, Breweries, Sugar Refineries, Tanneries, and various Manufacturing Purposes.

Manufactured by the Automatic Steam Vacum Pump Manufacturing Co. Office, 111 Broadway, New York.
SIMEON N. DRAKE, Pres. MARTIN KLENKE,
Send for Illustrated Circular.

PUBLICATIONS.

THE MANUFACTURER AND BUILDER,
Western and Company, Publishers,
37 Park Row, New York.

ANNUAL SUBSCRIPTION PRICE (invariably in advance), $1 50 each for less than four copies; four to nine copies, $1 25 each; ten to fourteen copies, $1 20 each; fifteen to nineteen copies, $1 10 each; twenty copies, $1 each. Papers are addressed to each name.

$250,000
To be Given Away!

UNPRECEDENTED
LIST OF PRIZES.

THE
Manufacturer and Builder,

Offers to both
REGULAR AND VOLUNTEER CANVASSERS.
For cash subscriptions,
Princely Premiums for Great Efforts,
And
GENEROUS RETURNS FOR THE SMALLEST FAVORS.

Almost anything in the world, great or small, that any body wants, can be acquired by canvassing for the

Manufacturer and Builder,

With less expenditure of time and labor, in most cases, than by any other method.

If not found with terms precisely specified in the following

Select Descriptive List of Hundreds of Rich Premiums,

It is only necessary to write to Western & Co., Publishers, 37 Park Row, New York, describing the COVETED ARTICLE, and special terms will be made for obtaining it as a Prize for Subscriptions; in most cases, terms that are equivalent to GIVING THE CANVASSER

NEARLY ALL HE CAN COLLECT,

As will be seen by examining the List.

In these days, CAPITAL is necessary for establishing the enormous circulation required to make a first-class periodical like THE MANUFACTURER AND BUILDER profitable in spite of its gigantic expenses. Capital is necessary to pay for the best productions of the best writers, for the costly designs and engravings, for the fine, thick paper, and for the extra style of printing, that make THE MANUFACTURER AND BUILDER the type of a new era in American polytechnic journalism. Capital is above all necessary to PAY THE ARMY OF CANVASSERS employed in bringing the merits and benefits of this journal home to the intelligent millions of the American people.

Our Plan for 1871
IS
CAPITAL WITHOUT STINT
For these purposes, and
MAGNIFICENT PAY
To all who help us.

We desire to pay out the coming year not less than a Quarter of a Million of Dollars from our receipts and reserves, for the services of Volunteer Agents alone, in all the States, Territories, and Provinces of North America. Our paper challenges comparison with the best Journals of Arts and Engineering in the world. It is at the same time one of the cheapest publications ever issued from the press; and to all its attractions we now add a range of Premiums tantamount almost to a free gift of our paper, our labor, our earnings, for the year, for the sake of introducing THE MANUFACTURER AND BUILDER to myriads of readers, whose patronage in future years will recompense our present lavish outlay.

For these premiums are to be not only offered, but **paid**; not only paid, but paid **promptly**, to the letter and spirit of the description, and to the satisfaction of all. Every premium is of the best and most desirable kind we can select, and from manufacturers whose names are a guarantee of excellence.

The premiums range from twenty-five cents to twelve hundred dollars in value—the prices annexed are in no case exaggerated, but the actual cash value invariably—so that one who aims at a large premium will not lose his labor even if obliged by any cause to suspend his efforts, because it is never too late to decide what premium to select, and no list is too small to earn a valuable prize, or rather a choice of many valuable prizes.

Every class of persons can share in this profitable employment, at times, in ways and in places suited to their circumstances, and with rewards adapted to their different desires.

You never know what you can do until you Try.

Thousands of persons, of both sexes, once straitened and perplexed to get a living, have suddenly found out that they had the gift to **get rich by canvassing!** Study the nature of the business, and particularly *human* nature; study the arguments and inducements for subscription to THE MANUFACTURER AND BUILDER, lay your plans well, and get every body to help you, and then let nothing discourage or stop you.

In the following table is given the price of each article and the number of subscribers required to get it free, at $1 50 a year; also at the club rate of $1 a year. The descriptions of a few articles are given in the fourth column, the balance is given in our *Descriptive Premium Sheet*, which will be sent on application to those who contemplate getting up clubs.

List of Premiums and Terms for Vol. III., 1871.

A Free Field for Everybody. No Competition.

No.	Names of Premium Articles.	Price of Premium.	Number of Subscribers required at $1 50	at $1
	FROM PATTERSON & BROS.			
1	Tool Chest	$45 00	60	190
2	Case Mathematical Instruments	9 00	18	55
3	Case Mathematical Instruments	15 00	22	75
4	Pocket Knife	1 50	4	21
5	Pocket Knife	2 00	5	22
6	Pocket Knife	2 50	6	25
7	Lady's Pocket Knife	2 00	5	22
8	One dozen Knives and Forks	14 00	21	70
9	One dozen Knives and Forks	18 50	27	90
10	One dozen Knives and Forks	22 00	33	110
11	One dozen Knives and Forks	25 50	39	124
12	Carver and Fork	5 00	13	37
13	Fluted Sharpening Steel	2 50	6	25
	FROM HALL, ELTON & CO.'S PLATE.			
14	One dozen Tea-spoons, medallion	5 75	14	40
15	One dozen Table-spoons, medallion	12 00	19	65
16	One dozen Table Forks, medallion	12 00	19	65
17	Butter-Knife, medallion, solid	1 00	4	
18	Soup-Ladle, medallion	5 75	14	40
19	Ice or Water-Pitcher, No. 3	17 00	26	80
20	Pocket Fruit-Knife, No. 12	2 00	5	22
21	Revolving Butter-Cooler, No. 80	8 00	16	52
22	Cake-Basket, No. 1867	10 00	18	58
23	Caster, 6 bottles, chased, No. 2039	9 25	18	54
24	Fruit-Basket, No. 200	13 50	21	75
25	Child's Cup, No. 041	2 75	6	25
26	Knife, Fork, and Spoon, child's set, morocco case	3 00	8	30
27	One dozen Napkin-Rings, medallion	9 00	17	54
28	Tea Set, gold lined, No. 1822	48 00	52	180
29	Tea Set, No. 1866	36 00	45	135
	FROM COLBY BROS. & CO.			
30	Knife-Cleaner	75	2	
	FROM MARIE, TODD & CO.			
31	Gold Pen and Pencil, rubber case	8 00	15	45
32	Gold Pen and Pencil, rubber case	6 75	13	37
33	Gold Pen, silver or gold holder, in box	4 25	9	32
34	Gold Pen, extension gold case, in box	20 00	29	90
35	Lady's Gold Pen, ivory holder, in box	2 75	6	25
	FROM HENRY RUSSELL & CO.			
36	Downer Mineral Oil Lamp, No. 1956	4 75	10	35
37	Downer Mineral Oil Lamp, No. 1955	9 25	17	56
	FROM C. F. A. HEINRICH.			
38	St. Germain Student Lamp, largest size	8 25	15	45
	FROM FAIRBANKS & CO.			
39	Family Scales	14 00	21	70
	FROM COLBY BROS. & CO.			
40	Clothes-Wringer	7 50	10	35
	FROM ALEXANDER M. LESLEY.			
41	Refrigerator, the Zero, No. 38	38 00	42	142
42	Cooler, the Newport, No. 1	12 00	15	45
43	Hot-Air Coal Furnace, the Gothic, No. 9	125 00	135	450
44	Hot-Air Wood Furnace, Gothic, No. 10	150 00	162	525
	FROM THE STANLEY RULE & LEVEL CO.			
45	Iron Smoothing-Plane, Bailey's patent	5 00	13	37
46	Iron Smoothing-Plane, Bailey's patent	6 50	14	42
47	Iron Jack-Plane, Bailey's patent	7 50	15	47
48	Iron Fore-Plane, Bailey's patent	9 00	17	55
49	Iron Jointer-Plane, Bailey's patent	10 00	18	58
50	Wood Smoothing-Plane, Bailey's patent	3 00	8	30
51	Wood Fore-plane, Bailey's patent	4 50	10	35
52	Wood Jointer-Plane, Bailey's patent	4 75	12	36
53	Wood Jointer-Plane, Bailey's patent	5 50	14	40
	FROM POST & GODDARD.			
54	Machinists' Hand-Taps	17 60	25	75
55	Machinists' Hand-Taps	52 80	65	220
56	Machinists' Hand-Taps (your choice)			
57	Screw-Plates and Dies, size A	5 00	12	37
58	Screw-Plates and Dies, size B	8 00	15	45
59	Screw-Plates and Dies, size C	10 00	18	58
60	Screw-Plates and Dies, size D	13 00	20	70
61	Tap-Wrenches, size A	3 00	7	25
62	Tap-Wrenches, size B	4 00	9	30
63	Tap-Wrenches, size C	5 00	12	37
64	Set of 11 Taper Shank-Twist Drills, No. 1	19 75	29	90
65	Set of 29 Drills, straight shank, mounted, No. 9	12 00	18	60
66	Set of 60 Drills, steel wire gauge from 1 to 60, No. 12	8 00	15	45
67	Set of 21 Taper-Shank Drills, No. 3	44 00	58	175
68	Set of 9 Bit-Stock Drills, 1-16 to 3 8 in	2 80	6	25
69	Self-Centering Drill-Chucks, Beach's patent, for jewelers, No. 0	10 00	18	58
70	Self-Centering Drill-Chucks, Beach's patent, for drilling, No. 0	7 00	14	40
71	Self-Centering Drill-Chucks, Beach's patent, 0 to 3-16, No. 1	6 00	13	38
72	Self-Centering Drill-Chucks, Beach's patent, 1 to 60 S. W. E., No. IX	7 00	14	40
73	Self-Centering Drill-Chucks, Beach's patent, 0 to ½, No. 3	14 00	23	77
74	Drill-Grinding Machine, No. 1	10 00	18	58
75	Drill-Grinding Machine, No. 2	20 00	30	95
76	Auger-Bits, your choice of 4 sets	— —	—	—
	FROM L. W. POND.			
77	Foot-Lathe, No. 1	50 00	65	204
78	Foot-Lathe, No. 2	30 90	47	124
	FROM COLBY BROS. & CO.			
79	Miniature Steam-Engine and Boiler	1 36	5	23
	FROM RUSSELL & ERIR.			
80	Steam-Engine (1 H. P.) and Boiler	300 00	310	1125
81	Steam-Engine (3 H. P.) and Boiler	600 00	640	2250
82	Steam-Engine (5 H. P.) and Boiler	800 00	858	3000
83	Steam-Engine (10 H. P.) and Boiler	1200 00	1285	4500
84	Steam-Pump, C. B. Hardick's, No. 0	120 00	155	540
85	Steam-Pump, Cameron & Co.'s, No. 1	150 00	192	675
86	Steam-Pump, Cameron & Co.'s, No. 2	200 00	257	900
87	American Submerged Pump	12 00	19	65
	FROM GEORGE TALLCOT.			
88	Turbine Water-Wheel, Reynold's, 12 in.	105 00	125	360
89	Turbine Water-Wheel, Reynold's, 24 in.	226 50	270	800
90	Turbine Water-Wheel, Reynold's, 36 in.	384 50	460	1350
91	Rotary Blower, Root's patent, No. 1	$50 00	70	275
92	Rotary Blower, Root's patent, No. 2	50 00	105	420
93	Portable Forge, Root's patent, No. 1	48 00	65	260
94	Portable Forge, Root's patent, No. 3	80 00	105	420
	FROM THE AMERICAN SAW CO.			
95	Circular Saw	125 00	135	473
96	Cross-Cut Saw	6 60	14	42
	FROM A. P. & M. STEPHENS.			
97	Labor-Saving Vise, 2-in. jaw	4 00	9	32
98	Labor-Saving Vise, 4½-in. jaw	12 00	28	58
	FROM THE STANLEY RULE & LEVEL CO.			
99	Boxwood two-foot Rule	2 50	6	25
100	Silver-Plated Triangular Drawing-Scale	6 00	16	52
101	Pocket Sheet-Metal Gauge	5 00	13	37
102	Arkansas Oil-Stone	1 75	5	22
103	Arkansas Oil-Stone, mahogany case	3 25	8	30
104	Gear or Cog-Wheel Calculating-Rule	4 00	12	36
	WESTERN & COMPANY'S AGENCY.			
105	Preparing and Filing a Caveat	25 00	28	80
106	Application for a Patent	30to40	35	100
107	Application for Patent and first Government fee	46to56	50	150
108	Application for Patent and all Government fees	66to76	75	250
	FROM J. W. HUTCHINSON.			
109	English Breech-loading double-barrel Gun	100 00	110	350
110	English Muzzle-loading double-barrel Gun	75 00	85	250
111	Breech-loading Rifle, the Allen	30 00	46	150
112	Revolver, Smith & Wesson's, No. 1½	12 50	19	65
113	Revolver, Smith & Wesson's, No. 2	15 00	22	75
	FROM MASON & HAMLIN.			
114	Melodeon, portable, No. 1, 4 octave	50 00	66	200
115	Melodeon, resonant, style G, 5 octave	170 00	146	510
116	Pipe-Organ, church use, style No. 29	675 00	579	2000
	FROM J. S. & C. ODELL.			
117	Pipe-Organ	500 00	430	1500
118	Pipe-Organ	700 00	600	2100
119	Bradbury Square Piano-Forte, No. 4	650 00	430	1500
120	Steinway's No. 1 Grand Piano	1200 00	860	3000
	THE AMERICAN WATCH CO., WALTHAM, MASS.			
121	Silver Watch	20 00	32	100
122	Silver Watch	35 50	48	142
123	Gold Watch	50 00	65	200
124	Lady's Gold Watch	100 00	110	350
	FROM THE UNITED STATES WATCH CO.			
125	Silver Watch	40 00	50	150
126	Silver Watch	66 00	75	275
127	Gold Watch	100 00	100	300
128	Silver Watch	104 00	104	312
129	A Sewing Machine (your choice)	65 00	65	200
	FROM MCALLISTER.			
130	Microscope and 45 objects	10 00	14	40
	FROM COLBY BROS. & CO.			
131	Velocipede for Boys	16 00	16	52
	FROM MCALLISTER.			
132	Magic-Lantern, No. 433	20 00	30	95
	FROM H THOMPSON.			
133	An Easy Chair			
	FROM D. APPLETON & CO.			
134	New American Cyclopædia, 16 vols	80 00	80	213
	FROM G. & C. MERRIAM.			
135	Webster's Unabridged Pictorial Dictionary	12 00	15	45
136	Webster's National Pictorial Dictionary	6 00	10	35
	FROM WESTERN & COMPANY.			
137	One back vol. Manufacturer and Builder, unbound, post-paid	1 75	6	25
138	Two back volumes Manufacturer and Builder, unbound, post-paid	3 50	11	37
139	One back vol. Manufacturer and Builder, bound, post-paid	2 50	9	32
140	Two back volumes Manufacturer and Builder, bound, post-paid	5 00	18	58
141	Cover for binding the Manufacturer and Builder, post-paid	60	3	21
142	A $10 Library (your choice from list in special sheet), *As paid through by mail or express.*	10 00	18	58
143	A $15 Library, "	15 00	24	86
144	A $20 Library, "	20 00	31	106
145	A $25 Library, "	25 00	38	126
146	A $30 Library, "	30 00	44	144
147	A $35 Library, "	35 00	50	162
148	A $40 Library, "	40 00	56	177
149	A $45 Library, "	45 00	62	192
150	A $50 Library, "	50 00	68	207
151	A $60 Library, "	60 00	80	237
152	A $75 Library, "	75 00	100	282
153	A $100 Library, "	100 00	125	360
154	A choice of good Books (see terms in another column)			
155	A choice of convenient Book-Cases (see special sheet)			
156	A choice of popular Music (see terms in special sheet)			
157	A choice of Games and Toys, (see terms in special sheet)			

We have taken especial pains to select in making up our price list the NEWEST and very BEST articles. No charge will be made for boxing or packing any article on our list. The Premiums, Nos. 4 to 7 inclusive, 31 to 35 inclusive, 79, 99, 101, 105 to 108 inclusive, 121 to 128 inclusive, 137 to 141 inclusive, 154, 156, 157, will each be delivered FREE of charge by mail or express (at the Post-office or express office nearest recipient) to any place in the United States or Territories. The other articles cost the recipient only the freight after leaving the manufactory of each, by any conveyance specified.

As an aid to those who engage upon large clubs, we will count subscriptions by *one* individual for 1869, 1870, and 1871, as *three* subscribers toward a premium. Every *new* subscriber should have the work upon the beginning. Bound volumes may be counted in the same way—each as one subscriber—except, of course, when they are obtained as a premium.

Do not fail to note the following Points:

1. All subscribers sent by one person count, though from one or a dozen different post-offices. But
2. State with each name or list of names sent that it is for a premium.
3. Send the names as fast as obtained, that the subscribers may begin to receive the paper at once. You can have any time, from one to six months, to fill up your list.
4. Send the exact money with each list of names, so that there may be no confusion of money accounts.
5. Old and new subscribers all count in premium clubs, but a portion, at least, should be new names; it is partly to get these that we offer premiums to canvassers.

N.B.—The extra copy to clubs of ten or twenty is not given where premium articles are called for.

6. Specimen numbers, cards, and show-bills will be supplied free, as needed by canvassers; but they should be used carefully and economically, as they are very costly.

7. Remit money in Checks on New York banks or bankers, payable to order of WESTERN & COMPANY, or send Post-Office Money Orders. If neither of these is obtainable, Register Money Letters, affixing stamps both for the postage and registry; put in the money and seal the letter in the presence of the postmaster, and take his receipt for it. Money sent in any of the above ways is at our risk.

DESCRIPTIVE LIST OF PREMIUMS.

Every Premium in the annexed list is described in the December MANUFACTURER AND BUILDER, *and also in a* **Special Descriptive Sheet,** *which will be sent* **free** *to every one desiring it. We have room here for the following only:*

Nos. 105 to 108—To Procure a Patent without Money.—We have met with many having valuable inventions, which inventors are anxious to get patented, but are unable to afford the expense, and consequently fail to secure the profits which a patent might produce. To such as are in this position, we make the following liberal offer: No. 105—We will prepare an application for a patent, attend to its passage through the Patent Office, and pay all government fees and incidental expenses attending the same, for any inventor presenting a patentable invention, who will get up a club of seventy-five subscribers for THE MANUFACTURER AND BUILDER for one year at $1.50 each, or 250 at $1 each, and send us the money by post-office order. If this application should be rejected, they may send us an additional list of thirty subscribers at $1.50 each, and the subscription money for the same, on receipt of which we will prepare and prosecute a second application, paying all government fees and incidental expenses. No. 107—For a list of fifty subscribers at $1.50 each, or 150 at $1 each, with the cash accompanying it, we will prepare an application, attend to its passage through the office, and pay the government fee ($15), the applicant paying the second government fee of $20. No. 106—For a list of thirty-five subscribers at $1.50, sent in the same way, we will prepare and prosecute an application, the applicant paying the government fee. No. 105—for twenty-eight subscribers at $1.50 each, or eighty at $1 each, we will prepare and file a caveat, furnish the necessary drawings, (which we also furnish in all the above cases), and pay all government fees. All cases placed in our hands under these arrangements will receive our best attention, equally with those for which our fees have been paid in cash, and will be appealed to the Board of Examiners-in-Chief if necessary, the applicant paying the government fee of $10 on such appeal. If the inventor has no model to accompany his application, he may procure additional subscribers, the premium on which (see cash rates) will enable him to pay for the model. A club of 100 names has been obtained in a single establishment where from 150 to 200 hands are employed. A village of 500 inhabitants will take this number readily.

No. 129—Sewing Machines.—Your choice! A $65 machine for 65 subscribers, at $1.50 each.—It makes no difference to us which machine we send, or whether it is selected at first or at the last moment. No charge for boxing the machines; they go safely as freight. For circulars, giving full particulars in regard to style of machines, fixtures, etc., as well as instructions, send to **Grover & Baker Manufacturing Co.,** 495 Broadway, New York; **Florence Sewing Machine Co.,** 505 Broadway, New York; **Wilcox & Gibbs Sewing Machine Co.,** 658 Broadway, New York; **Singer Sewing Machine Co.,** 458 Broadway, New York.

Nos. 137, 138—Volumes of the Manufacturer and Builder.—The unbound volumes of THE MANUFACTURER AND BUILDER consist of a set of numbers for a year, each separate in its own paper cover. These volumes amount to a valuable Library on all matters pertaining to the Industrial Arts, and contain more varied information on manufacturing, building, and mechanical subjects than can be obtained in books costing three times as much. The price of the volumes unbound is $1.50 each, at the office, or $1.75 if sent by mail, as they must be post-paid. They are profusely illustrated, the engravings used in them having alone cost thousands of dollars. For ordinary use, the sets of numbers unbound will answer quite well.

Nos. 139, 140—Bound Volumes of the Manufacturer and Builder.—*New* subscribers almost invariably desire to secure the back numbers of THE MANUFACTURER AND BUILDER from its commencement. Some desire them bound in our uniform style, while others prefer to get the loose numbers and have them bound to suit their own tastes. *Our* binding is very neat, and being done in large quantities at one time, is furnished at a *very cheap* rate. It is moreover very handsome, being of cloth, with gilt title and back, sides embossed and ornamented with a neat architectural device stamped in gold. The price of the volumes is $2.50 each, sent post-paid.

No. 141—Covers for Binding the Manufacturer and Builder.—These are described in premium 139, 140. Now ready for 1869 and 1870. Be careful to state *which year* you require. Any country binder will insert the year's numbers in one of these covers at a moderate cost. Price, 50 cents; sent, *post-paid*, on receipt of three subscribers at $1,50 for each cover.

Nos. 142 to 154—Good Libraries.—In these premiums we offer a choice of books for manufacturers, mechanics, artisans, builders and others. The person entitled to any one of the premiums 142 to 153, may select any books desired from the list published in our Special Premium Sheet, to the amount of the premiums, and the books will be forwarded, post or express paid. $25 or $50 worth of books pertaining to the industrial arts will give the boys new ideas, set them to thinking and observing, and thus enable them to make their heads help their hands. Any good book will, in the end, be of far more value to a youth than to have an extra hundred dollars on coming to manhood. ☞ Let the mechanics of a neighborhood unite their efforts, and through these premiums get an industrial library for general use.

No. 154—General Book Premium.—Any one sending twenty-five or more names may select books from our list to the amount of ten cents for each subscriber sent at $1; or thirty cents for each name sent at $1.20; or sixty cents for each name at $1.50. *This offer is only for clubs of twenty-five or more. The books will be sent by mail or express, prepaid through by us.*

SPECIMEN COPIES, CIRCULARS, SHOW-BILLS, etc.,

will be furnished free of charge in sufficient quantities to meet the reasonable requirements of agents. We would respectfully request that they do not waste them, but distribute them judiciously. If some unexpected event should prevent them from continuing in the business, they will do the square thing by us by giving their outfit to some friend, who will continue the business where they have left off; and, who will no doubt be grateful for the opportunity of receiving profitable employment.

Postage.

Every subscriber pays his own postage at the office where he receives the paper. This is only twenty-four cents per year, or six cents per quarter, payable in advance.

Don't Give up Your Town

until everybody has been supplied with a circular and has had a chance to subscribe; and be sure that you

PUBLICATIONS.

leave your address, so that they may know where to find you in case they should make up their minds to take the magazine after you have left them. Make all drafts, money-orders, and registered letters payable to the order of Western & Company, publishers, and address all communications

WESTERN & COMPANY, Publishers,
NO. 37 PARK ROW, NEW YORK.

TABLE OF CASH PREMIUMS For 1871.

EVERY MAN HIS OWN PAY-MASTER. STEADY EMPLOYMENT AND GOOD PAY.	PREMIUMS. At $1 50 each.	PRE'S. At $1 00 each
For every club of 4 subscribers.....	$1 00	
" " " 10 "	3 00	
" " " 15 "	6 00	
" " " 20 "	10 00	
" " " 30 "	16 50	$1 50
" " " 40 "	24 00	4 00
" " " 50 "	32 50	7 50
" " " 75 "	48 75	11 25
" " " 100 "	65 00	15 00
" " " 200 "	140 00	40 00
" " " 500 "	350 00	100 00
" " " 1000 "	700 00	200 00

INTERMEDIATE CLUBS.

It often happens that clubs are made up of numbers that are not found in the above table. Names may be added to clubs at the following rates :

In clubs of	4	and less than	10..	$1 25	for each name.	
" "	10	" "	15..	1 20	"	"
" "	15	" "	20..	1 10	"	"
" "	20	" "	30..	1 00	"	"
"	30	" "	40..	95	"	"
" "	40	" "	50..	90	"	"
" "	50	" "	200..	85	"	"
" "	200	" "	500..	80	"	"
" "	500	" "	1000..	80	"	"
" "	1000	and over.....		80	"	"

The Profits of the Cash Business, it will be seen by the above tables, are large and accrue rapidly. Every experienced canvasser knows that it is far easier to obtain 4 subscribers to a paper like THE MANUFACTURER AND BUILDER at $1 50 each than to get 1 subscriber to a high-priced magazine, costing $6. This is more strikingly evident when the fact is taken into consideration that our paper, costing only $1 50, is ACTUALLY SUPERIOR IN EVERY RESPECT TO ANY THING OF THE KIND IN THE COUNTRY COSTING TWICE THAT SUM.

There is another point in favor of our Magazine, as compared with a higher-priced periodical. This is the well-known fact, that in a manufacturing establishment, or even in a town, the working-men will rarely look at a paper costing $3 or $6, and the result is that only rich persons, comparatively, and proprietors can be solicited with any success. Now, these persons are scarce in any community ; and a paper that comes within the means and comprehension of the masses or majority of the people, of course commands an immensely wide field. Hence, instead of getting only the proprietor of a manufactory, or the rich men of a town, the working-men can be approached with success ; and out of a single establishment as many as 100 subscribers have easily been obtained. This is a very important point to canvassers, and where the large profits with but little effort come in. Try it.

Make all drafts, money orders, and registered letters payable to the order of WESTERN & COMPANY, Publishers, and address all communications,

WESTERN & CO., Publishers,
"The Manufacturer and Builder,"
37 Park Row, New York.

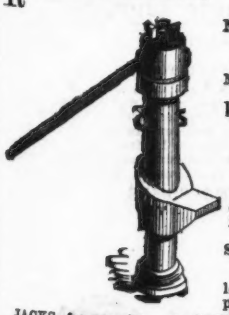
INSTRUCTION.

SCHOOL OF MINES, COLUMBIA COLLEGE.

FACULTY.—F. A. P. BARNARD, S.T.D., LL.D., PRESIDENT; T. EGLESTON, JR., E. M., Mineralogy and Metallurgy; C. F. CHANDLER, PH. D., Analytical and Applied Chemistry; JOHN TORREY, M.D., LL.D., Botany; C. A. JOY, PH. D., General Chemistry; W. G. PECK, LL.D., Mechanics; J. H. VAN AMRINGE, A.M., Mathematics; O. N. ROOD, A.M., Physics; J. S. NEWBERRY, M.D., LL.D., Geology and Paleontology. Regular courses in Mining Engineering; Metallurgy; Geology and Natural History; Analytical and Applied Chemistry. Special students received for any of the branches taught. Particular attention paid to Assaying. For further information and catalogues, apply to

DR. C. F. CHANDLER,
nov21-1y-is Dean of the Faculty.

RICHARD DUDGEON,



No. 24 Columbia st.,
NEW YORK,
Maker and Patentee of
Hydraulic Jacks
AND
Punches,
Roller Tube Expanders, and Direct Acting
Steam Hammers.
Communications by letter will receive prompt attention.

JACKS for pressing on CARWHEELS or CRANK PINS made to order. May22:1y

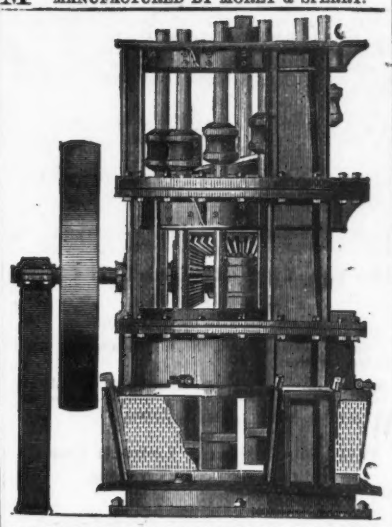
E. F. DUNNE,
Attorney and Counsellor at Law,
1301 F STREET, WASHINGTON, D. C.,

PACIFIC COAST.—Will practice in all the Federa Courts. Specialty in Patents for Lands, Mines, and Town-Sites. mar15-1y

FILE-COVERS. FILE-COVERS. For preserving the numbers of the ENGINEERING AND MINING JOURNAL. Price $1 50. For sale by WESTERN & CO., 37 Park Row, New York.

MINING MACHINERY. ETC.

MINING MACHINERY OF ALL KINDS.
MANUFACTURED BY MOREY & SPERRY.



HOWLAND PATENT ROTARY BATTERY

of 12 stamps. It requires no frame to put it up. Guaranteed to crush 2½ to 3 tons per day to the stamp. The best Battery ever used for amalgamating gold, or crushing silver ores, dry or wet. Can be put up on a mine in running order for one-half the price of the straight battery, and in three days after its arrival at the mine. 12-stamp battery, 20,000 pounds, with frame complete ; 6-stamp battery, 7,000 pounds. Every mill run at shop before shipping.

CALIFORNIA STAMP MILLS,

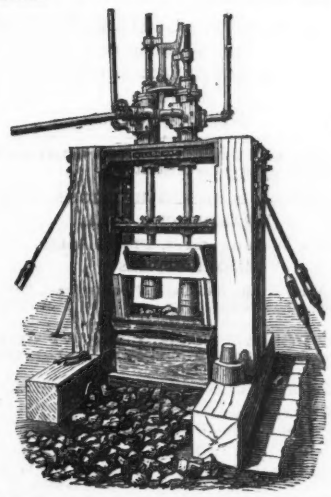
All the various styles of Pans, Amalgamators, Rock Breakers, Separators, Settlers, Concentrators, Dry or Wet, for working Gold, Silver or Copper Ores, the same as built in California and at lower prices. SHOES AND DIES made of the best white iron. Send sizes and we will make patterns and forward Shoes and Dies at low prices. Engines, Boilers and fixtures, and other Machinery made to order. Also, Howland's Patent Rotary Valve Double or Single Engines.

Irons for the best California stamp mill, straight battery, complete. Also, Irons for low mortar, old style mill, and all other kinds.

☞ Send for a Circular.
Address
MOREY & SPERRY,
Jan 10:y 95 Liberty Street New-York.

THE WILSON PATENT
Steam Stamp-Mill Company,
OF PHILADELPHIA, PA.

Are now prepared to supply Miners and other parties with their



New Steam Stamp-Mills
AT THE SHORTEST NOTICE.

These Mills have now been in operation for upwards of a year, and have proved to be the most durable and efficient, as well as the lightest for transportation, of any mills now used. The valve gear is of the simplest and most durable construction, readily adjustable by movable cams on the piston rods or stamp stems, thereby giving the operator absolute control of the length and velocity of motion and force of the blow. These Mills are adapted for both dry and wet crushing, and for the hardest rock or softest cement. These Mills are every way equivalent to a Twenty Stamp Mill. For further particulars call on or address

THE WILSON PATENT STEAM STAMP-MILL COMPANY,
Aug31-1y 326 Walnut street, Philadelphia.

KROM'S DRY ORE CONCENTRATOR.

Concentration by means of Air

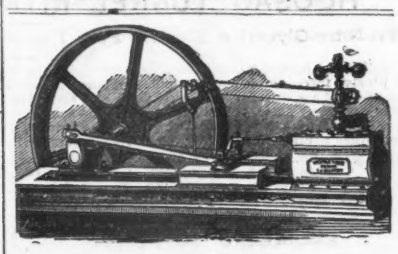
has long been attempted, but hitherto without satisfactory results. **S. R. Krom** has invented and patented machines which concentrate the various ores more perfectly than can be done by any other means.

The *MECHANICAL COMBINATIONS* are extremely simple, the machines therefore correspondingly durable. A continuous self-delivery of ore on one side and tailings on the other is effected, hence very little attention is required, except keeping the hopper supplied with ore The power of one man is sufficient to operate a mach in that will concentrate one ton per hour.

PARTIES INTERESTED IN MINING are invited to call at No. 210 Eldridge Street, New York, where they may see a machine in operation, and have samples of their own ores crushed and concentrated.

Illustrated Circulars may be had on application to
STEPHEN R. KROM,
sn10,1y-is No. 210 Eldridge Street, N. Y.

ENGINES, IRON WORK, ETC.



TODD & RAFFERTY.
GENERAL
MACHINERY MERCHANTS, ENGINEERS, AND MACHINISTS,

Manufacturers of Stationary and Portable Steam Engines and Boilers ; also Flax, Hemp, Tow, Oakum, and
ROPE MACHINERY,
MILL GEARING,
SHAFTING.
Lathes, Planers, Drills, Chucks, etc. Iron and Brass Castings. Judson & Snow's Patent Governors constantly on hand.

OFFICE AND WAREROOMS, NO. 10 BARCLAY STREET, N. Y.
Office and Works, Paterson, New Jersey.
JOSEPH C. TODD. oct-27-tf. PHILIP RAFFERTY.

CIRCULAR SAWS WITH EMERSON'S PATENT MOVEABLE TEETH.

These Saws are meeting with unprecedented success, and their great superiority over every other kind, both as to efficiency and economy, is now fully established

Also,
EMERSON'S PATENT PERFORATED CIRCULAR AND LONG SAWS,
(All Gumming avoided,) and
EMERSON'S PATENT ADJUSTABLE SWAGE,
for Spreading, Sharpening, and Shaping the teeth of all Saws. Price, $5. Manufactured by the

AMERICAN SAW COMPANY
Office No. 1 Ferry St., corner Gold St., New York.
Factory, Trenton, N. J. Branch Office for Pacific Coast, No. 606 Front St., San Francisco, Cal.
Send for new Descriptive Pamphlet and Price List.
july1-1y

COOPER'S GLUE AND REFINED GELATINE.

COOPER HEWITT, & CO.,
NO. 17 BURLING SLIP, NEW YORK.

Bar Iron, Braziers' Rods, Wire Rods, Rivet and Machinery Iron, Iron and Steel

Wire of all Kinds, Copperas,

&c., &c.

RAILROAD IRON, COOPER WROUGHT IRON BEAMS AND GIRDERS,

Semi and Cast-Steel. Gun-Barrel and Compcnent Iron,

PUDDLED AND REFINED [illegible] COAL BLOOMS,

Ringwood Anthracite and Charcoal Pig Iron.

Works at Trenton and Ringwood, N. J.
May 17:1y

ALBERT BRIDGES,
MANUFACTURER AND DEALER IN
Railway and Mining Supplies and Machinery.

Ball's Patent Telescope Jack.

NO. 46 COKTLANDT STREET,
P. O. Box. 2813. NEW YORK.
Aug 31-1y

J. CLAYTON'S
Patent Fly Wheel and Direct Action
STEAM PUMPS,
HAND PUMP AND STEAM ENGINE COMBINED.

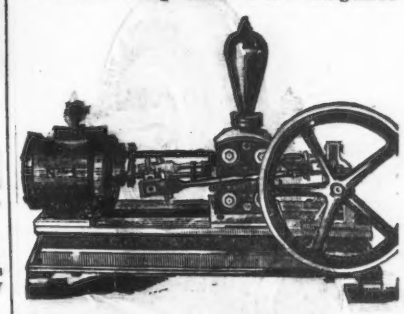
These pumps are the cheapest first-class pumps in the market.

All sizes made to order at short notice.

JAMES CLAYTON, 24 & 26 Water st.,
Office : 50 John street, New York.
Nov18-tf Brooklyn, N. Y.

STEAM PUMPS.

THE WOODWARD
Steam Pump Manufacturing Company.
MANUFACTURERS OF THE
WOODWARD PATENT IMPROVED SAFETY
Steam Pump and Fire Engine.

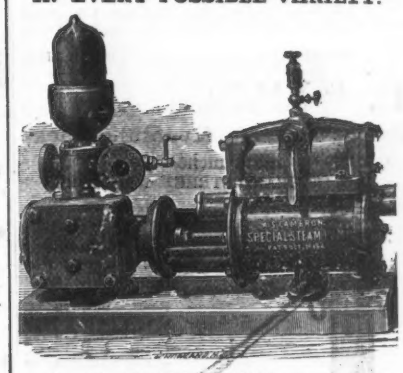


STEAM, WATER, AND GAS FITTINGS OF ALL KINDS.

Also dealers in WROUGHT IRON PIPE, BOILER TUBES, etc. Hotels, Churches, Factories, and Public Buildings, heated by Steam, Low Pressure.

Woodward Building, 76 and 78 Centre street, corner Worth street, New York. Formerly 77 Beekman street
mar 14-1y GEORGE M. WOODWARD, Pres't

PUMPS
IN EVERY POSSIBLE VARIETY.



A. S. CAMERON & CO.,
FOOT 23d STREET, E. R.,
oct18:1y NEW YORK.

GUILD & GARRISON, MANUFACTURERS OF

Steam Pumps,
Vacuum Pumps,
Steam Engines,
Vacuum Pans,
And all the various connections. For sale at the STEAM PUMP WORKS, 26, 28 and 30 First street, Williamsburgh, N. Y.
sep14-6m

Niagara Steam Pump Works.

CHARLES B. HARDICK,
9 ADAMS STREET, BROOKLYN, N. Y.
Sole Manufacturer of
HARDICK'S PATENT DOUBLE-ACTING
Steam Pump and Fire Engine.
Patented in England, Belgium and France. Send for circular. feb-13-1y

WOOD ENGRAVING
EXECUTED AT THE OFFICE OF
The Engineering and Mining Journal
No. 37 PARK ROW, NEW YORK CITY.

DUNCAN, SHERMAN & CO.,
BANKERS,
Corner of Pine and Nassau Streets, New York.

Issue Circular Notes and Letters of Credit for Travelers available in all the Principal Cities in the World.

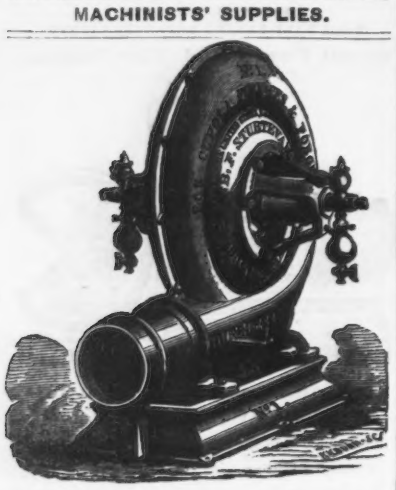
TRANSFERS OF MONEY TO EUROPE AND THE PACIFIC COAST BY TELEGRAPH.
☞ Interest allowed on Deposits. feb-1y

AGENTS AND CANVASSERS WANTED
IN EVERY CITY AND TOWN IN THE UNITED STATES.
FOR THE
Engineering and Mining Journal.
Liberal inducements. Specimens sent free. Addres
WESTERN & COMPANY,
37 Park Row, New York

Advertisements.

Advertisements admitted on this page at the rate of 40 cents per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter press.

MACHINISTS' SUPPLIES.



B. F. STURTEVANT'S
PATENT IMPROVED
PRESSURE BLOWER,
FOR CUPOLA FURNACES AND FORGES.

Also manufacturer of the Sturtevant Patent Improved Fan Blower and Exhaust Fan. Send for illustrated catalogue.
B. F. STURTEVANT, 72 Sudbury street, Boston, Mass.

E. LYON, MANUFACTURER OF
Patent Portable Hydraulic Jacks and Punches.
NO. 470 GRAND STREET, NEW YORK

For Raising Heavy Weights, such as Locomotives Boilers, Guns, Heavy Machinery, Wrecking Purposes, putting together Water and Gas Pipes, pushing off Cranks and Propellers, Pulling, Proving Chains and Ropes, setting up Rigging, or Pulling Stumps, Punching and Shearing Iron, Die-Sinking, etc.

☞IMPROVED PATENT HYDRAULIC JACKS, that run out their entire length in a HORIZONTAL or any other position.

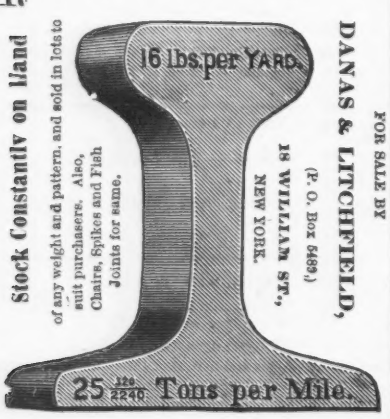
PATENT HYDRAULIC PUNCH,
For Punching Iron, Die-Sinking, etc. Ap 12;1y

H. A. ROGERS & CO.,
Successors to
JOHN ASHCROFT, and WALTON & Co.,
Railway & Machinists' Supplies,
50 and 52 JOHN STREET.

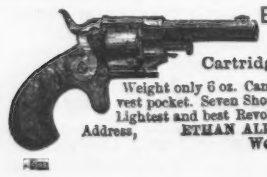
Sole Agents for
ASHCROFT'S STEAM GAUGE,
Also Agents for
LINDSAY WRENCHES,
STURTEVANT BLOWERS,
JUDSON GOVERNORS,
WILDER'S PATENT PIPE-WRENCH AND CUTTER.
Manufacturers of
STEAM and WATER GAUGES,
Importers of
SCOTCH GAUGE GLASSES.

Steam Gauges Repaired.

RAILROAD IRON FOR MINES.


Stock Constantly on Hand
of any weight and pattern, and sold in lots to suit purchasers. Also, Chairs, Spikes and Fish Joints for same.
16 lbs. per YARD.
25 125/2240 Tons per Mile.
DANAS & LITCHFIELD,
18 WILLIAM ST., NEW YORK.
(P. O. Box 5496.)
FOR SALE BY

Light Locomotives, for use in Collieries, Mines, etc.
mch13-6m



E. Allen & Co's
NEW MODEL
Cartridge Revolver.
Weight only 6 oz. Can be carried in the vest pocket. Seven Shots, 22-100 calibre. Lightest and best Revolver in the world.
Address, ETHAN ALLEN & CO.
WORCESTER, Mass.

HOOSAC TUNNEL NITRO-GLYCERINE WORKS.

Tri-Nitro-Glycerine, Electric Fuse Exploders, Pure Gutta Percha Insulated Wire.

The Tri-Nitro-Glycerine manufactured under the Mowbray Patents is safer to handle, has 30 per cent. more plosive force, and is a more stable compound, than can be made by the Nobel Process. Our fuses are safe to handle and are sure fire. We purify our own Gum Gutta Percha, and insulate copper wire with machinery (the result of many years' investigation), with the sole view to render blasting with Nitro-Glycerine perfectly safe and 50 per cent. cheaper than with powder. Proved to have double the force in blasting over Dualin, Dynamite, and other adulterations of inferior Nitro-Glycerine with inert matter.

PATENTS—No. 76,499, April 7, 1868.. No. 96,465, Nov. 2, 1869.
No 93,113, July 20, 1869 No. 106,606, Aug. 23. 1870. Address GEORGE N. MOWBRAY,
No. 94,969, Sept. 21, 1869 No. 106,607, Aug. 23, 1870. NORTH ADAMS, MASS.
[Feb. 21, 3m.]

ENGINEERS' SUPPLIES.

STEAM ENGINES

FROM 4 TO 500 HORSE-POWER,
Including CORLISS PATENT CUT-OFF ENGINES, SLIDE VALVE STATIONERY ENGINES, and PORTABLE ENGINES. Also, IMPROVED CIRCULAR SAW MILLS, etc.
Send for Descriptive Circular and Price List.
WOOD & MANN STEAM ENGINE CO.,
UTICA N. Y.
Warerooms, 42 Courtland Street, New York; and 201 and 203 South Water Street, Chicago, Ill.
nov-7-1y-os

LAFLIN & RAND,
POWDER CO., 21 Park Row, opposite Astor House, New York,
invite attention to their facilities for delivering
BLASTING POWDER,
SAFETY FUSE,
ELECTRICAL BLASTING APPARATUS, &c.,
wherever required, from having nine manufactories in different States, beside agencies and magazines at all distributing points. nov. 1:1y

B. KREISCHER & SON,
New York Fire Brick

AND
STATEN ISLAND
Clay Retort Works.
Established 1845.
B.K FIRE BRICK
Office, 58 Goerck Street, Corner Delancy Street, East River, New York. mar28-1y-q

Four First Premiums, American Institute, 1870.
THE ALLEN ENGINE WORKS,
Fourth Av. and 130th and 131st Streets,
New York City.
MANUFACTURERS OF
THE ALLEN ENGINE
PORTER'S GOVERNOR,
The Allen Boiler, and
STANDARD STRAIGHT-EDGES,
Surface-Plates, and Angle-Plates.
Four First Premiums awarded at the Fair of the American Institute, 1870.
Send for an Illustrated Circular.

Fishkill Landing Machine Works,
Established 1853.
FISHKILL-ON-THE-HUDSON, N. Y.

STEAM ENGINES,
Iron and Brass Castings, Forgings, Boilers, and Machinery.
Sole Manufacturers of the celebrated LOOMIS STEAM ENGINE, with Patent Variable Cut-off by the Governor.
Jobbing and Repairs promptly attended to.
JAS. L. TELLER, Secretary. MILO SAGE, President
sept13:1y

NEW YORK BELTING AND PACKING COMPANY. The oldest and largest manufacturers the United States of
Vulcanized Rubber Fabrics,
Adapted to Mechanical Purposes,
nvite the attention of all who are interested in the sale or use of such articles to the high standard quality and w prices of their various manufactures, comprising
chine Belting, Steam Packing, Leading Hose, Suction Hose, Car Springs, Wagon Springs, Billiard Cushions, Grain Drill Tubes,
etc., etc., etc.,
"TEST" HOSE
made expressly for the use of Steam Fire Engines, and will stand a pressure of 400 pounds per square inch. Officers of Fire Departments requiring new hose, will find this much superior in strength and quality to any other.
PATENT SOLID EMERY VULCANITE WHEELS, a composition of rubber and emery, making a very hard uniform substance of the nature of stone throughout. These wheels for grinding and polishing metals, "gumming" saws, etc., are the most economical and effective tools that can be used.
WAREHOUSE, 37 AND 38 PARK ROW, NEW YORK.
JOHN H. CHEEVER, Treasurer.
☞Price lists and further information may be obtained by mail or otherwise on application.
oct30-1y-os

THEODORE ALLEN,
ENGINEER,
No. 45 William street, New York.
Designs and Specifications prepared for all kinds of Iron Ships and Steam Machinery. Construction and Repairs superintended. Experiments conducted. Advice given, etc. All kinds of Machinery furnished Manufacturers' prices. feb8-t

COAL SHIPPERS.

HONEY BROOK COAL COMPANY, Exclusive Miners and Shippers of the Celebrated
Honey Brook Lehigh Coal,
23 Trinity Building,
No. 111 BROADWAY, NEW YORK.
Wharves, Elizabethport, N. J. Philadelphia office 209 Walnut street.
ap20-1y J. B. McCREARY, President.

WHITE, FOWLER & SNOW.
Wilkesbarre and Lehigh Coal,
FOR STEAM AND FAMILY USE.
OFFICE
Room No. 75, 111 BROADWAY, (Trinity Building).
JNO. WHITE,
jan1-1y LINDLEY H. FOWLER,
LOUIS T. SNOW.

THE NEWBURGH ORREL COAL COMPANY.
Mines at Newburgh, Preston Co., W. Va.
Company's Office, No. 52 S. Gay St. Baltimore, Md.
C. OLIVER O'DONNELL.....President.
CHAS. MACKALL.....Secretary
This Company offer their very superior Gas Coal at lowest market prices.
It yields 10,996 cubic feet of gas to the ton of 2,240 lbs. of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.
It has been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to the Manhattan. Metropolitan, and New York Gas Light Companies of New York, the Brooklyn and Citizens' Gas Light Companies of Brooklyn, N. Y., the Baltimore Gas Light Company of Baltimore, Md., and Providence Gas Light Company, Providence, R. I.
The best dry coals shipped, and the promptest attention given to orders. sep21-1y

RANDOLPH BROTHERS, Sole Agents of the original
Spring Mountain Lehigh Coal.
Extensively used for Smelting Iron.
☞Rooms, 28 and 30 Trinity Building,
prôtf NEW YORK.

WILKESBARRE COAL, DELIVERED DIRECT from the Mines of
The Wilkesbarre Coal and Iron Co.,
or for re-shipment at
HOBOKEN AND JERSEY CITY.
OFFICE:
ap1-1y 80 Broadway, New York.

POWELTON COAL AND IRON COMPANY
Sole Shippers of the Celebrated
Powelton Semi-Bituminous Gas
AND ANTHRACITE COALS,
104 Walnut street, Philadelphia.
BRANCH OFFICES:
New York, Trinity Building; 17 Doane street, Boston
Cleveland, O.; Pittsburgh, Pa. jan30-1s

THE DESPARD COAL COMPANY OFFER their Superior DESPARD COAL to Gas Light Companies throughout the country.
MINES IN HARRISON COUNTY, West Virginia.
Wharves, Locust Point, Company's Office, No. 29 South st. } Baltimore.
AGENTS:
PARMELE BROTHERS, No. 32 Pine street, New York.
BANGS & HORTON, No. 31 Doane street, Boston.
Among the consumers of Despard Coal we name Manhattan Gas Light Co., New York; Metropolitan Gas Light Co., New York; Jersey City Gas Light Co., Jersey City, N. J.; Washington Gas Light Co., Washington, D. C. Portland Gas Light Co., Portland, Maine.
☞Reference to them is requested. may30-1y

LEWIS AUDENRIED & CO., MINERS AND Shippers of the following celebrated
ANTHRACITE COALS.
From Philadelphia and the Mines,
DIAMOND, Red Ash; SPOHN, Red Ash; ORCHARD, Pink Ash; BROAD MOUNTAIN, White Ash; LOCUST MOUNTAIN, White Ash; BLACK HEATH, White Ash; Old Company's Lehigh; Wilkesbarre.
From Port Johnston and Jersey City,
Old Co.'s Lehigh, Hazleton, Wilkesbarre, and Shenandoah Coals.
Also the superior CUMBERLAND COALS.
BROAD TOP, at Philadelphia. BARTON, SEMI-BITUMINOUS, at Baltimore. BARTON, GEORGES CREEK, at Alexrndria.
205 Walnut street, Philadelphia; 14 Kilby street, Boston, 34 Westminster st., Providence; 24 Second st., Baltimore, 110 BROADWAY, NEW YORK. Jan13.y

G. B. LINDERMAN & CO.,
MINERS,
Sugar Loaf, Lehigh Coal.
OFFICE, 50 TRINITY BUILDING, 111 BROADWAY
may23-1y NEW YORK.

COXE BRO.'S & CO., CROSS CREEK COLLIERY Miners and Shippers of the Celebrated
Cross Creek Free Burning Lehigh Red Ash COAL.
FROM THE BUCK MOUNTAIN VEIN.
OFFICES:
Philadelphia, No. 341 Walnut street.
Drifton, Jeddo P. O., Luzerne Co., Pa.
Agent in New York, SAMUEL BONNELL, Jr., Room 43, Trinity Building,
feb-1y 111 Broadway.

MICROSCOPES FOR SCIENTIFIC INVESTIGATIONS and Educational Purposes. Price list sent free. T. H. McALLISTER, Optician,
c2l-6m. 49 Nassau street, N. Y.

MISCELLANEOUS.

MOUNT SAVAGE FIRE BRICK
GOVERNMENT STANDARD.
Manufactured by the
Mount Savage Fire Brick and Mining Company.
This Company having acquired the Fire Clay properties and Brick Works of the
Consolidation Coal Company,
will receive orders for their unequalled FIRE BRICK for Blast, Puddling, Smelting and Glass furnaces. Diagrams of shapes and prices will be furnished on application to
J. S. MACKIE, Pres., 71 Broadway, New York. Room 44.
JAMES A. MILLHOLLAND, Vice Pres.,
Dec. 7.tf Mount Savage, Maryland.

THE BISHOP GUTTA-PERCHA WORKS,
422, 424 & 426 East 25th St.
Office at Factory, NEW YORK.
SAMUEL C. BISHOP, Proprietor,

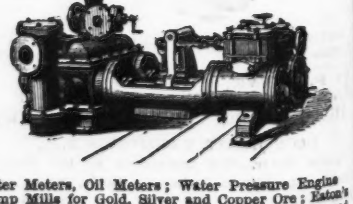
The *only* manufacturer in the United States of every variety of goods, made from *Pure Gutta-Percha.*
SUBMARINE TELEGRAPH CABLES.
Submarine Wires, insulated for Mining and Blasting use.
Telegraph and Electric Wires for office and other uses, of all sizes; Cotton and Silk Covered Wires, of all sizes; Bishop's Compound Cordage for air lines and outside connections; Underground Wires, covered with Gutta-Percha and Lead protection; Underground Wires, with fibre and Bishop's Compounds.
Any kind required made to order.
In addition to Telegraph and Electric Goods, I make all kinds of Pure Gutta-Percha goods, such as Belting for use in Water; Sheet for Surgical use; Sheet for various Mechanical uses; Lining for Acid and Chemical Baths; Bottles, Pitchers, and Funnels for Acids; Tissue Sheets for Caps and Hats; Soda and Beer Pipe; Boxes for Flax Machinery, etc., etc.
N. B.—TILLOTSON & CO., 8 Dey street, New York, and BLISS, TILLOTSON & CO., 247 South Water street, Chicago, are General Agents for the sale of any Telegraph and Electric Goods made by me, at Factory prices.
JOHN THORNLEY, 503 Chestnut street, Philadelphia, Pa., is Agent for the sale of any goods made by me at Factory prices.
☞Orders also received at Factory for all kinds made.
Any goods of my manufacture, "excepting Telegraph and Electric Goods," are for sale in New York, by H. G. NORTON & CO., 26 Park Place; RUBBER CLOTHING CO., 347 Broadway; A. D. & C. A. HODGMAN, 201 Broadway, N. Y. sept13:4m

THE BEST TURBINE WHEEL.
SWAIN'S
Gave 5 **Per Cent.** better results at the **Lowell Test** than any of its **Highly Polished Competitors.**
It will give from 30 to 100 per cent. more power, in proportion to its size, than any other wheel.
Guaranteed to give from 10 to 50 per cent. more power, with the same water, than any other wheel in the market. It is the best made, most compact, runs longer without repairs, and gives better satisfaction than any other wheel.
☞Send for report of tests, with description and diagrams.
SWAIN TURBINE CO.,
Dec 6:6m North Chelmsford, Mass.

HORTON AND MABIE
PEEKSKILL. NEW-YORK.
Fire Brick Works.
MANUFACTURERS OF ALL SHAPES OF
FIRE BRICK
FOR IRON WORKS, LIME KILNS, FANNERS, &c., &c., &c.
Particular attention given to the manufacture of linings for Cupola Furnaces.
Blocks and Tiles for all Purposes.
BRASS FURNACE CIRCULARS.
Stove and Range Linings of every description to order.

MACHINISTS' SUPPLIES.

HYDRAULIC WORKS.
MANUFACTORY,
BROOKLYN, N. Y.
Steam Pumping Engines, Single and Duplex, Worthington's Patent, for all purposes, such as Water Works Engines, Condensing or Non-condensing; Air and Circulating Pumps, for Marine Engines; Blowing Engines; Vacuum Pumps, Stationary and Portable Steam Fire Engines; Boiler Feed Pumps, Wrecking Pumps.
MINING PUMPS,



Water Meters, Oil Meters; Water Pressure Engine Stamp Mills for Gold, Silver and Copper Ore; Eaton's Gatent Amalgamators for Gold and Silver; Steam and Gas Pipe, Valves, Fittings, etc. Iron and Brass Castings.
☞Send for Circular.
H. R. WORTHINGTON,
feb1-1y 61 Beekman street, New York.

THE ENGINEERING AND MINING JOURNAL.

VOL. XI.—NO. 11.—THIRD SERIES.] NEW YORK, TUESDAY, MARCH 14, 1871. [SINGLE COPIES 10 CENTS.

Deep Placer Mining in California.

[Continuation.]

DIAMOND POINTED STEAM DRILLS—THEIR APPLICATION TO MINING OPERATIONS IN CALIFORNIA.

These machines were first introduced on this coast by SEVERANCE, HOLT & Co., in the early part of 1870, and used on Telegraph Hill, San Francisco, where holes were bored two inches in diameter and from twenty to thirty-five feet deep, for blasting purposes. These holes were made merely to show what the machines could do, and were bored twenty feet in from three to four hours; and thirty-five feet in less than six hours. The contractor, who was taking out the rock for the new bulkhead, and making holes of a corresponding depth, same size at the bottom, but much larger at the top with hand-power, on the old-fashioned "churn" drilling process, employed six men from twenty to twenty-five days to bore a single hole the same depth, at a cost of over ten dollars per foot. The machines were worked by two men, an engineer and fireman. The holes made by the "Diamond Drill" are perfectly round and of a uniform size, which makes them much more effective than those made by the old process. The contractor claimed that the amount of rock displaced by a blast put in one of those holes was eight or ten times greater than by the old system of drilling. Holes were made three feet deep in seven minutes.

The first deep boring done near San Francisco was at Mission Creek, through the same character of rock, for an artesian well. This hole was made three hundred and twenty-seven feet deep and three inches in diameter.

In Tuolumne county the company bored prospecting holes near Don Pedro Bar and Tuttletown. At the latter place MESSRS. GOULD & COOPER bored seven perpendicular holes through talcose slate, porphyry and sand-stone, and cores were taken out showing the character of rock. The Diamond Drill made from 10 to 35 feet per day of ten hours. The holes were made from 30 to 157 feet deep.

At Carson's Hill, Calaveras county, the company used a machine on the "Union Mine," prospecting for the direction and value of the different leads. These holes were made from 120 to 317 feet in depth. The rock bored through was slate mixed with quartz. These holes were all bored at an angle of about 45°, and the machine made as high as 70 feet in a single day, of ten hours, through slate with quartz streaks through it. In five hours 13 feet of white crystal quartz was bored. This was the hardest rock found in the mining districts.

Near San Rafael, in Marin county, on the premises of Mr. GEORGE WORN, the company bored several holes 2½ inches in diameter and from 100 to 300 feet deep, for artesian wells. The rock here was of a very peculiar character and generally very hard. It changed very often from sand-stone, hard and close-grained, to a conglomerate of slate, volcanic rocks, flint and basalt mixed. This boring was very difficult, nevertheless the machine made as high as 24 feet in six hours.

The company have machines at the Pacheco Mine, Monterey county, for prospecting purposes, and in various other places in the State; also one in the White Pine district, and are constructing one to be run by compressed air for the Blue Point Gravel Mining Company of Smartsville, Yuba county, Cal., a description of which will be found under the heading of "The Smartsville Hydraulic Mines." Should this machine prove a success, in point of execution and economy, and recent experiments at Smartsville leave no doubt on that subject, we may reasonably expect the construction of many extensive drain tunnels in California, which were formerly considered impracticable on account of the expense.

These tunneling machines are made to suit the size of any tunnel, as per order. The compressors required to run one of these machines in a long tunnel, are arranged to work by any power convenient, and do the double duty of working the drilling machine and ventilating the tunnel at the same time.

Most of these machines are made to run by steam, but those for tunnels, shafts, stopes, etc., are intended to have compressed air for the motive power. Prospecting machines with horizontal boilers on wheels are constructed, which can be used to bore prospecting holes 1000 feet if necessary, taking out a core the entire depth, and having sufficient power to lift the refuse matter out of a shaft, or do any work in which strong power is required, without disturbing the progress of the drill in the least.

HAVING given a general review of the condition and prospects of placer mining, we will proceed to a description of some of the most prominent districts and the mines found therein. In the description of mines we have selected those which may be considered as representatives of their districts, with no intention to disparage the merits of equally important claims in the same vicinity.

THE SMARTSVILLE HYDRAULIC MINES.

THESE mines are situated among the foothills of Yuba county, near the south bank of the Yuba river, about eighteen miles east of Marysville, and are noted for the gigantic character of the engineering works constructed for their development, and the princely incomes enjoyed by their owners. The mining ground here consists of a strip of auriferous deposits two miles in length by a quarter of a mile in width, overlying an ancient channel, and having an average depth of 240 feet. The elevation of the bed rock above the water level of the Yuba river is about 500 feet. This river runs parallel with the course of the ancient stream from which it is less than one mile distant. The consequence is that the companies working this deposit have been compelled to run long tunnels with a slight grade, and do not possess the natural advantages for the construction of dumps and undercurrents, which form such an important feature in saving the gold in hydraulic operations. The whole extent of this ground is now owned by six or seven companies, each having separate bed rock tunnels in the course of construction and nearly completed—the most noted of which is the Blue Point Gravel Company's tunnel—the largest and most expensive undertaking of the kind in the State. It is not improbable that there is as much rich ground in the State embraced within a like era, but none which has been so systematically worked, and yielded such large returns.

Mining in this vicinity was commenced as early as 1849 and 1850—though at that time confined to the banks of the Yuba river. Subsequent exploration revealed the existence of the gravel ridge, but after working on it to a depth of from two to four feet a hard cement was encountered which could not be worked, by the primitive mode of mining then in vogue, with returns sufficient to pay the miners, and for a time the deposit was considered exhausted and attention again directed to the partially worked-out bars and banks of the Yuba.

In the fall of 1854 attention was again directed to the prospecting of the rich placiers of Sucker Flat. Shafts were sunk on what is now known as the Blue Point Mining Company's claims to the depth of some fifty feet, passing through good pay ground and striking rich gravel similar to that found in the bed of the Yuba river, which proved to be the gravel of an ancient river channel. Prospecting was then actively commenced in every direction. A shaft was sunk on what is now known as the Blue Gravel Company's mine, striking the same gravel as that found by the Blue Point Company. It required a large extent of ground to justify the running of a bed rock tunnel to drain and work these deep diggings, and the Blue Gravel Company was formed by the consolidation of several small companies into a corporation which commenced a tunnel, making but little progress upon it until the present owners became interested. After some eight years of incessant toil they completed the tunnel in 1864, from the working of which several parties realized large fortunes, and the mine is still producing handsomely. This tunnel proved too high to work the old river channel to the bottom—there being some thirty feet of gravel below the present working level, to open which a second bed rock tunnel, 1,500 feet in length, is now being constructed, two-thirds of which is already completed.

Product of the Mines.—An intelligent contributor of the *Overland Monthly* (August and September numbers, 1870,) in a series of papers descriptive of these mines, makes the following statement of the product of the Blue Gravel Company's mine from the time of opening up to May, 1870: "This mine commenced operations in 1853, and during the nine succeeding years the amount taken from it was $315,000. This was prior to and during the building of the main tunnel, and was all used for current expenses. In 1864 the tunnel was completed, and the showing becomes more favorable; for, during the forty-three months that followed, the amount was $837,000, or an average of $19,465.51 per month. The net earnings during the same time were $627,000; the cost of operating the mine being $5,000 per month, with 61,000 used for improvements. From 1868 to 1870, or about three years, the amount (given approximately) will hardly equal the former average. Taking $16,000 as the monthly product, which is probably a moderate estimate, we have $576,000. Granting this estimate, the gross product of the mine, from 1853 to 1870 and date, is $1,728,000."

Lying to the eastward of Blue Gravel Company's claim, we find the ground of the Smartsville Hydraulic Mining Company. This company was formed by the consolidation of numerous claims which had been partially worked, and was incorporated under its present name about the year 1868, with a capital stock of $200,000, none of which was called in, as the surface workings realized enough for current expenses, pending the construction of a tunnel for outlet. They were about one year in preparing for expensive operations and made their first "run" in 1869, since which time the following "clean ups" have been made:

April, 1869	$ 11,506	March, 1870	$ 48,970
July, 1869	30,410	June, 1870	54,662
December, 1869	49,062		
Total			$194,610

The dividends of this company for the present year, up to date (October, 1870), have aggregated over $50,000, and it is estimated that before the close of the year at least $30,000 more will be disbursed in dividends.

There are about 250 or 300 miners employed in this vicinity at the present time, at wages varying from $3 to $3.50 per day. The total product of the Smartsville mines has been estimated at $4,000,000 up to 1870. The extensive system of works being carried on here will insure the continuance of mining for at least twenty years more.

Timbuctoo.—The mines of Timbuctoo, on the western extremity of the Smartsville deposit, have been worked for a longer period, and though not now equally productive have been estimated to have yielded $2,000,000. Recently, however, an enterprise has been inaugurated which, from its success, promises to bring these claims again into notoriety. Mr. O'BRIEN, one of the largest land owners in this vicinity, has erected on the ground of the Pactolus Company a ten stamp mill, for the purpose of cleaning up the bed rock and working the cement which the water has not carried off. This mill is run by water power, with a turbine wheel, and the total expense of running, labor included, is about $40 per day. In cleaning up bed rock a number of Chinese are employed, who pick down the rock to a depth of a few inches, where crevices occur, and sweep up the dirt and rock with hand brooms of cane, until it is as clean as a floor. All this dirt, together with the harder cement, which is broken up by white labor, passes through the stamps, and in this manner fifty or sixty tons per day are crushed. The gold-saving method is the simplest—amalgamation in battery, copper plate, riffle boxes and a tail sluice. As a large portion of the bed rock is exposed here from former hydraulic washing, all the work is carried on in open air. The first "clean up," for eight days' run of twenty-four hours per day (made Oct. 20, 1870), yielded 195 ounces of retorted gold, worth about $18.60 per ounce—leaving a handsome profit after paying for the mill, which cost only about $2,500.

Bed Rock Tunnels.—Among the bed rock tunnels now in progress we may mention: The Pactolus, 800 feet, nearly completed; Pittsburg and Yuba River Mining Company, 1,700 feet, half completed; Blue Gravel Company, 1,500 feet, 1,000 feet completed. But the most important of all, on account of the great extent and richness of ground for which it will be an outlet, and the expensive character of the work, in the Blue Point Gravel Mining Company's tunnel—probably the most extensive mining operation of the kind in the State. This work, although projected for a long time, was not commenced until February, 1867. In order to make a certainty of being deep enough to work the old river channel to the bottom, the tunnel was commenced as low as practicable, to give sufficient dump at the river for tailings. This brings the Blue Point tunnel into the old river channel, sixty feet deeper than the Blue Gravel Company's present working level, and one hundred and ten feet deeper than the present level of the workings of the company. This tunnel is 2,270 feet in length, six feet wide on the bottom, and eight feet high—the entire distance through hard flinty trap rock. Two shafts were sunk on the line of the tunnel to the grade—one 123 feet in depth; the other 138 feet in depth. From these shafts the work was carried forward on both faces of each shaft, and from the mouth of the tunnel—making five working faces—the rock and debris being hoisted through each shaft to the surface, by an engine and whim erected for the purpose. During the first year the work was carried on by contract from $34 to $45 per linear foot. The contractors, using common blasting powder, made such slow progress at times—six men making only ten feet in a month—that upon the introduction of Giant Powder they were released, the work being taken in hand by the officers of the company. They employed six men on each face with single-hand drills, using Giant Powder. The men were divided into eight hour shifts—one set not being allowed to leave until relieved by the next set. In this manner the hammers were never allowed to stop, either night or day.

This work was so far completed in November, 1870, as to permit the raising of a shaft in which gravel was struck. The tunnel will however be carried some 400 or 500 feet further, so as to reach the centre of the channel. For the prosecution of this work the Diamond Drill will be used, as that invention has been tried in an experimental way in this same tunnel, and found to accomplish all that was claimed for it, but the steam power used was not adapted to tunnels of this size and length, on account of the excessive heat generated by the pipes, which

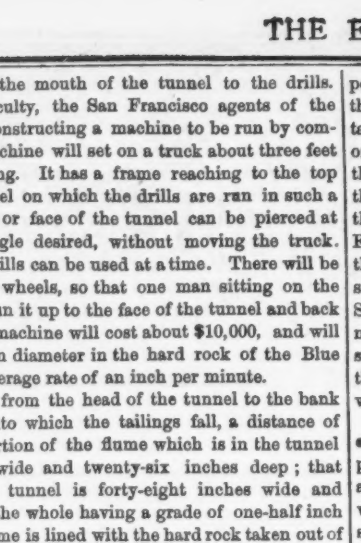
carry the power from the mouth of the tunnel to the drills. To obviate this difficulty, the San Francisco agents of the Diamond Drills are constructing a machine to be run by compressed air. This machine will set on a truck about three feet wide and four feet long. It has a frame reaching to the top and sides of the tunnel on which the drills are ran in such a manner that the rock or face of the tunnel can be pierced at any place, or any angle desired, without moving the truck. One or all of these drills can be used at a time. There will be a crank geared to the wheels, so that one man sitting on the machine can easily run it up to the face of the tunnel and back in a moment. This machine will cost about $10,000, and will bore holes one inch in diameter in the hard rock of the Blue Point Company at average rate of an inch per minute.

The flume extends from the head of the tunnel to the bank of the Yuba river, into which the tailings fall, a distance of 4,650 feet. That portion of the flume which is in the tunnel is forty-two inches wide and twenty-six inches deep; that portion outside the tunnel is forty-eight inches wide and thirty inches deep—the whole having a grade of one-half inch to the foot. The flume is lined with the hard rock taken out of the tunnel for a depth of one foot. This lining, it is expected, will last for six months; it will be taken up and turned after the first run.

We are indebted to Mr. LYMAN ACKLEY, of Smartsville, Secretary of the Blue Point Gravel Co., and one of the earliest miners of this district, for the following details of this extensive operation: "In prosecuting this work 9,000 pounds of steel drills have been worked up; nearly 10,000 bushels of coal for smith shop; 1,327,900 points sharpened on drills; 94,000 feet of lumber used in work shops, out-buildings, etc.; 600 kegs of blasting powder; 275 pounds of nitro glycerine; 600 boxes of the best candles; 4,400 pounds of Giant powder; 65,000 feet of fuse; for engine and foundry work $5,175 has been paid; 4,400 feet of the flume are lined with quarried rock twelve inches thick; 140,000 feet of lumber was used to build flume; it will require 8,000 pounds of quicksilver to charge the same; 800 inches of water will be used on the mine per pay, at a cost of $80 per day. The cost of these entire improvements is $150,000."

The Excelsior Canal Company own the principal water privilege here. They have about 100 miles of ditch; the longest in any one stretch, however, is 33 miles. In the driest season, they furnish 3,000 inches of water; in winter, 6,000 inches. They also own extensive and valuable mining ground.

Powder Blasts.—One of the characteristics of mining operations at Smartsville, is the use of large quantities of powder in blasts, for the purpose of breaking up the cemented banks preparatory to washing them off. Blasts of two hundred or three hundred kegs are of almost monthly occurrence, but blasts of such dimensions as one for which preparations are now being made by the Blue Point Gravel Mining Company, in which 2,000 kegs of powder will be exploded, are sufficiently rare to merit a detailed description. The bank to be raised in this instance is 73 feet deep, 275 feet long, and 200 feet wide. The annexed diagram will convey some idea of the manner in which the powder is distributed.



The ring on the diagram represents the termination of the incline from the tunnel, which will be 73 feet below the surface. From this point a main drift is run, with cross drifts as laid down in the diagram—each drift being three by four feet in dimensions. The blast will be discharged by a galvanic battery, for which purpose wires are carried through the main drift, going in on one side of the cross drifts, thence passing out through the drifts on the opposite sides. A cartridge, connected with the wire, is then placed in a keg of powder in each of the cross drifts, there being ten points at which the powder will be fired simultaneously. The heads are taken out of the kegs of powder—of which 2,000 will be used in this blast—which will be equally distributed through the drifts. The mouth of the main drift, to the first cross drift will then be firmly tamped, leaving a large open space in the balance of the drifts, which greatly increases the explosive effects of the powder, and the blast will be fired. From past experience it is believed that the entire mass of earth, comprising 150,000 cubic yards, will be raised from six to ten feet.

BETWEEN THE MIDDLE AND SOUTH YUBAS.

The easterly extremity of the Smartsville deposit is found at Mooney Flat, one-half mile from the grounds of the companies above described. From this point to French Corral, on the north bank of the South Yuba, distant ten or twelve miles on an air line, there are no surface traces of the ancient channel. It is probable that the gravel range extending from French Corral through Birchville and Sweetland to the Middle Fork of the Yuba river, near North San Juan, is identical with the Smartsville deposit, and that between Mooney Flat and French Corral it has been broken by the South Yuba, which runs through a gorge nearly 1,600 feet lower than the bed rock of the ancient channel at French Corral. The fact that the deposit does not make its appearance between the south bank of the South Yuba and Mooney Flat, may be accounted for by taking into consideration the denuding action of Deer Creek, once a powerful stream, which runs on about the same level as the bed rock of the ancient channel. The eroding action of these two streams, have undoubtedly broken up and scattered the ancient channel deposit between the points above named. From French Corral to Moore's Flat, a distance of nearly thirty miles, between the South and Middle Yubas, we find a series of mining towns, the most noted of which are North San Juan and North Bloomfield. The auriferous deposit is not, however, continuous and the deposits do not belong to the same system—the lower one coming in from Camptonville and the upper one from Snow Tent—the latter being covered with volcanic matter.

French Corral.—This locality has been worked from a very early period in the history of mining in Nevada county and has proved uniformly rich. The width of the auriferous deposit is about 1,000 feet, with an average depth of 150 feet—130 feet of which is hydraulic dirt, the balance being cemented gravel of sufficient hardness to require crushing. The bed rock is granite and slate, with narrow seams of quartz at the junction of these formations. Water is brought from Shady Creek, a distance of ten miles, through a ditch having a capacity of 2,500 inches, and which cost, with its reservoirs, at least $150,000. Water is sold at 12½ cents per inch. The ditch is owned by W. M. EDDY & Co., who also conduct the most extensive mining operations in this locality. They own 1,800 feet on the channel, and use 1,000 inches of water per day, running their dirt through a tunnel 1,000 feet in length and 2,500 feet of flume. They have also a fifteen stamp mill for crushing the cement. Two other mills are in operation here—the Empire, twenty stamps, and the Kansas Co., ten stamps. The latter company are now taking out between $400 and $500 per day. EDDY & Co.'s mill has fifteen stamps of 650 pounds each, run by a "hurdy-gurdy" wheel twelve feet in diameter, using seventy-five inches of water under a fall of 146 feet. This company have been using one-eighth inch screens, but propose to change them for screens having quarter inch apertures. This will permit the escape of the small pebbles and will increase the crushing capacity of the mill from eighty to one hundred tons per day. One of the companies operating here has tried this experiment with satisfactory results, having increased their crushing capacity twenty-five per cent. without any diminution of the product per ton. The gravel crushed in EDDY & Co.'s mill has averaged between $4 and $5 per ton, and the expense of milling and mining has not exceeded $56 per day, or 70 cents per ton (or sixteen cubic feet). The cement is loosened by powder blasts and the mining carried on above ground. For this purpose, powder drifts are run with single hand drills, and fine powder used in the blast holes. Mr. EDDY estimates the advantages of this over the old system (large drills and coarse powder) at fully thirty per cent. The construction of two bed rock tunnels is in contemplation here, each of which will be from 1,600 to 1,800 feet in length, and will debouch on the South Yuba river. On account of the many seams found in the bed rock the cost of running tunnels here rarely exceeds $15 per linear foot. The estimated gold product of French Corral for 1870, is $200,000, and the same amount may be anticipated for 1871. From French Corral to Birchville, a distance of two miles, less than one thousand feet of the bed rock has been stripped, and it is estimated that not more than one-tenth of the surface dirt has been run off.

Birchville and Sweetland.—At Birchville, the Bedrock Tunnel Company have just completed a tunnel from the Middle Yuba, 2,600 feet in length, at a cost of $36,000. This company do not own enough surface ground to remunerate them for this extensive work, and until the surface ground and the tunnel are owned by one company, but little work will be done at this place, though the ground is known to be rich. At Buckeye Hill, near Sweetland, the Buckeye Hill Mining Company, an English corporation, are carrying on extensive operations, with good prospects for large returns for 1871.

North San Juan.—This was formerly one of the most populous mining towns of Nevada county, but is now suffering from the stagnation incident to the exhaustion of the most accessible ground. There is yet much ground to work, but the present prices for water—sixteen and two-third cents per inch—does not afford renumeration to small owners, and many claims are passing into the hands of the ditch company. When the claims here shall have been consolidated extensive operations will be resumed. During the past season only four claims have used water.

The American Company's Claims.—The beneficial effects of consolidation may be illustrated by the success which has attended the operations of this company. The grounds of the American Company are located on Manganita Hill, about one and a half miles west of the town of North San Juan. Commencing at the bluff overhanging the Middle Yuba their claim runs 4,000 feet in a southerly direction—the general course of the channel being from north to south, and the grade of the old river bed falling at the rate of ninety feet to the mile. The width of the pay dirt is from 400 to 500 feet, with an average depth of 175 feet from surface to bed rock. The bed rock is granite and has a well defined seam or crack running through it, from north to south, near the middle of the channel, and penetrating to unknown depths. This seam has been found 800 feet below the bottom of the old channel, at a point where the main bed rock tunnel has been commenced, and the various tunnels of the company, commencing on the hill side overhanging the Middle Yuba, have followed it, thereby diminishing the expense of running these tunnels from $40 to $15 per linear foot. The ground of this company was worked as early as 1853, but it did not pass into the hands of the present owners till 1863, when additional ground was purchased from time to time at an expense of over $140,000 until the present extensive tract was acquired. This tract has a superficial area of about forty-two acres, and estimating its average breadth at 450 feet and depth at 175 feet, would give 11,597,100 cubic yards of auriferous dirt. Considerably less than one-half of this immense tract has been run off and has yielded $1,000,000, of which $400,000 has been profit. Estimating the product of the remaining ground at twenty-eight cents per cubic yard, which is lower than the estimates of Professor SILLIMAN or Professor LAUER for this mining region, and consistent with the past results of the working of the company, we are warranted in the belief that this claim will yet produce $2,000,000, of which more than one-half will in future be realized as profit. Even with the present improvements in this branch of mining, it is not probable that the undeveloped ground of the company can be washed off in less than sixteen years, without taking into consideration the lower grade of dirt left on the sides of the channel, or the cement on the bed rock which requires crushing. The company are now running from 500 to 800 inches of water per twenty-four hours, using four two and a half inch streams and a "Craig Monitor" nozzle of six inches diameter, as occasion requires. Water here is an expensive item—costing sixteen and two-third cents per inch—but this company have an arrangement by which they pay 12½ cents per inch for the excess over 500 inches used in twenty-four hours. Since opening the ground they have constructed over 6,000 feet of tunnel and have laid nearly 10,000 feet of flume, of which 6,000 feet is now in use. These tunnels, commencing at the highest, are of the following dimensions: No. 1, 300 feet; No. 2, 600 feet, (these two are no longer used, having run off all the ground they opened); No. 3, 1,800 feet; No. 4, 2,500 feet. The present washing is through the two latter. Tunnel No. 5 (the lowest) will be the longest and will open the entire ground of the company. It was commenced on the seam or crack above referred to, about two hundred feet above the level of the Middle Yuba and will have a total length of nearly one mile. It will be seven feet in hight, from roof to bottom of flume, and five feet wide. It rises from the mouth at the rate of one foot in sixteen and will strike the gravel near the back line of the company's ground. One thousand feet have been completed (Nov. 1, 1870,) and contract let for one thousand more at $15 per linear foot. When 3,500 feet have been run a shaft will be raised, a flume put in, and ground will be run through it, but the main tunnel will be carried on slowly to completion. The American Company has extraordinary facilities for saving its gold by reason of its natural advantages of location. The northern extremity of the ground terminates on a bold bluff overhanging the Middle Yuba, and from 800 to 1,000 feet above that stream. The company have availed themselves of this advantage by the construction of a system of dumps and undercurrents, of which there are twenty-five—some of the dumps having a perpendicular fall of twenty feet or more, followed by the most improved undercurrents. As the term "undercurrent" is often used in the description of this class of claims a brief description will be *apropos*.

They consist of a set of side flumes, from ten to fifteen feet in width, arranged close along side of the main flume, which is broken, at intervals, where a sufficient fall can be had, and close to the mouth of the same, open riffles, made of heavy iron bars, are placed, through which descend the fine gravel and flour gold, and over which pass the large rocks. The undercurrent has a side connection underneath, and is so arranged as to be wider for the first few feet, causing the water to spread and run slower, and then the undercurrent, being heavily charged with quicksilver and completely riffled, naturaliy catches the gold. In some claims, a succession of these undercurrents, for half a mile or more, exists, and the last often pays from $100 to $300 per year, for cleaning up. In consequence of these facilities a greater proportion of the gold is saved here than in any claim which has come under our observation. The total length of flumes is 6,000 feet, to charge which 1,600 pounds of quicksilver are used, at a cost of between $1,100 and $1,200. The company have their own furnace for retorting and melting, and turn out their product in bars which are sent to San Francisco to be refined. They have also an eight stamp mill, run by water power, for crushing their cement. The mill will crush about forty tons per day, but is not in constant use. Chinamen are employed to clean the bed rock, which is picked down a few inches and swept clean with hand brooms. Besides the Chinese, from sixteen to twenty white men are employed. The underlying gravel and cement is very hard in places and requires the use of blasts. An average of 1,000 kegs of powder is used for this purpose, at a cost of $2.80 per keg. One of the objects of interest at this claim is the great "pot-hole." This hole is worn out of the solid granite bed rock of the old channel by the action of a rapid current turning a large stone of some harder material than the granite. The hole is the shape of an inverted cone—six feet in diameter at its mouth and tapering to a diameter of six inches at the bottom, a distance of fifteen feet. At the bottom was found a round stone—probably the same one which commencing at the top wore its way downward by attrition, reducing its size from several feet in diameter to a few inches. It would be an interesting problem to ascertain the length of time the stone was occupied in this process. Among the many ingenious contrivances introduced here is a set of signals, twelve in number, communicating by ropes between the mouth of the lower tunnels and the men engaged in piping on the bank above. By the simple movement of a hand on a dial any one of twelve signals is instantaneously shown on the roof of the mill, where it may be seen for a distance of half a mile. By this means the water can be shut off without sending a man a half a mile to deliver a message from the flumes. The owners of this claim are nearly all practical miners and a majority of them work on the claim,

which is superintended by Mr. T. S. CRALL, who opened the ground in 1853, and has been one of the largest owners. The American Company's claim is one of the most valuable mining properties in California, and its success has stimulated more active operations in this branch of mining. W. A. S.

New Volumetric Method for the Estimation of Copper.

By M. F. W. WEIL.

THE well-known fact that there has been hitherto no thoroughly reliable method for the estimation of copper in ores and alloys, and also when mixed with other metals, which interfere with the estimation of the copper, induced me to seek for a mode of operation which answers well in practice and is readily executed. It is as follows :—

The principles upon which my method is based are : (1). That with an excess of free hydrochloric acid, and at boiling heat, the presence even of the smallest quantity of chloride of copper may be detected by the greenish yellow color of the solution, this color being the stronger and more prominent the more free hydrochloric acid prevails. (2.) The aqueous solutions of chloride of copper which contain free hydrochloric acid become, when boiling, upon the addition of protochloride of tin, instantaneously converted into colorless solutions of protochloride of copper, according to the formula $^2CuCl+SnCl=Cu_2Cl+SnCl_2$. The reaction is quite finished as soon as, by the addition, drop by drop, of the protochloride of tin, the green color of the perchloride of copper is changed to the colorless protochloride of copper. Even a single drop of the protochloride of tin added in excess can be readily detected by the addition of a single drop of a solution of corrosive sublimate, which produces a precipitate of white protochloride of mercury. It is clear, therefore, that the quantity of the solution of protochloride of tin which is required for the perfect decoloration of the copper solution will indicate the quantity of the copper present in the solution, which, if it contains iron along with the copper, the iron will have to be estimated in a separate portion of the solution by means of permanganate of potassa ; while, in the estimation of the copper, the quantity of protochloride of tin, equivalent to and converted by the iron into perchloride of tin, has to be deducted.

1. *Preparation and Keeping of the Solution of Protochloride of Tin.*—Take about 6 grms. of tin-foil (this material ought first to be tested for its purity), dissolve in 200 c.c. of pure hydrochloric acid at a boiling heat, and with the addition of some pieces of platinum wire ; the tin solution thus obtained is diluted to 1000 c.c. by the addition of distilled water, and is poured into a wide-mouthed glass bottle, after which the solution is covered over with a layer of petroleum. This bottle is provided with a glass syphon-tube and stop-cock attached, and also with a funnel-tube for replenishing the solution, which, although kept under petroleum, and thereby protected from the action of the air, only keeps sufficiently steady and unaltered for a single day, so that the liquid has to be tested and accurately titrated every morning before using it for the estimation of copper in solutions wherein the quantity of that metal is unknown.

II. *Titration of the Protochloride of Tin for Pure Copper.*—Take chemically pure, re-crystallised, pulverised sulphate of copper deprived of adhering moisture by pressing between filtering-paper ; weigh off 7.867 grms. (equal to 2 grms. of pure metallic copper), dissolve in distilled water, and dilute to 500 c.c. ; keep this solution as normal solution of copper in a glass-stoppered bottle. Take of this solution, by means of a pipette, 25 c.c. (equal to 0·1 grm. of pure copper); pour this quantity into a flask capable of containing 100 c.c. ; add 5 c.c. of pure hydrochloric acid, which causes the blue fluid to become deep green ; and next boil the liquid upon a sand-bath ; then take a burette, divided into c.c. and 1:10th c.c., fill it with the solution of protochloride of tin up to zero, and immediately after pour rapidly into the boiling copper solution sufficient of the tin salt to cause the same to become very nearly decolorised. After this, the tin solution is added, drop by drop, until the copper solution is as clear and colorless as distilled water is ; as soon as this point has been reached, add with a pipette again 5 c.c. of pure hydrochloric acid, and, if by this addition the slightest green coloration is produced, protochloride of tin is added, drop by drop, until the decoloration is complete ; after this, the quantity of tin solution employed is read off. If it is desired to make sure that the end of the reaction is properly reached (a precaution which is quite unnecessary if 10 c.c. of hydrochloric acid have been added), 1 c.c. of the colorless solution is taken, by means of a pipette, and poured into a test-tube ; this tube is placed in cold water to promote the rapid cooling of the contents ; and, after cooling, there is added to the solution one drop of a concentrated aqueous solution of chloride of mercury. If this does not bring about a turbidity or precipitate, it is best to add to the contents of the flask another drop of protochloride of tin solution ; this having been done, the testing of the contents of the flask by means of chloride of mercury, as just mentioned, is repeated ; and if a turbidity or precipitate ensues, the quantity of tin solution applied is read off, care being taken to deduct therefrom 1-20th of a c.c. Every 16·2 c.c. of the tin solution correspond to 0·1 grm. of metallic copper.

III. *Example of Titration of any compound of Copper not containing either Iron or Nickel.*—Take four grms. of the metal, either reduced to powder, or at least cut (not filed) to a convenient size ; dissolve in strong nitric acid contained in a long-necked flask ; expel the excess of this acid by boiling with excess of sulphuric acid, or with hydrochloric acid, in case silver is contained in the substance taken for assay ; next, water is added, and the bulk of the fluid brought to from 250 to 500 c.c., according to the presumable quantity of copper present, care being taken to mix the liquid thoroughly, and thereby render it uniform throughout. It is not absolutely required to remove by filtration insoluble substances, such as silica, sulphate of lead, stannic acid, antimonic acid, chloride of silver, and the like, since these substances settle readily to the bottom of the tall cylindrical jar employed for containing the liquid, while the assay is being made. The tin solution is added after the addition, as above stated, of some 5 or 10 c.c. of hydrochloric acid. Example : Two grms. of an alloy containing much copper were made into a solution of 250 c.c. ; 25 c.c. thereof having been taken for assay, required 25·42 c.c. of protochloride of tin solution, of which 16·2 c.c. corresponded to 0·1 grm. of pure copper. The 25 c.c. of the solution of the alloy taken for assay contain, therefore, 0·1569 grm. of copper, because 16·2 : 25·42=0·1 : 0·1569 ; consequently the quantity of copper contained in 250 c.c. is = 1·569 grm., because 0·1569×10=1·569 ; and therefcre 100 grms. of the alloy contain, according to the following equation :

1·569×50=78·45 per cent. of copper.

IV. *Titration of a Compound of Copper which also contains Iron.*—The weighing off of the substance, its solution in acid, and the titration of 25 c.c. of the joint solution of the two metals, is performed as described under III., with this difference, that the operation of adding the tin solution is performed with the solution of the metals contained in a flask of a capacity of at least 250 c.c. After the total quantity of tin solution required at the first titration has been noted, the titration of the iron is executed in the following manner : Some 25 or 50 c.c. of the sulphuric acid solution are diluted with a large quantity of water, and placed in a flask of 250 c.c. capacity ; to this metallic zinc and platinum wire are added, and left in the solution until it is perfectly colorless ; the entire quantity of copper, tin, lead, arsenic, antimony, &c., which might be present is precipitated in the metallic state ; the colorless fluid is then decanted, and the iron volumetrically estimated by means of permanganate of potassa. Since perchloride of iron, as well as the chloride of copper, is reduced by protochloride of tin, according to the following formulæ—

$Fe_2Cl_3+SnCl=^2FeCl+SnCl_2$, and

$^2CuCl+SnCl=Cu_2Cl+SnCl_2$,

it is evident that the quantity of protochloride of tin which corresponds to the iron is found by simple calculation from the experiments made, as will be best illustrated by the following example:—Four grammes of a copper ore, which also contained iron, were dissolved, and the solution made to 250 c.c. ; of this solution, 25 c.c. were taken for assay, and found to require 26.75 c.c. of protochloride of tin solution of 16.2 title. By titration with permanganate of potassa, 25 c.c. of the solution under assay were found to contain 0·0809 grm. of iron. The protochloride of tin solution employed corresponds with 18·34 c.c. for 0.1 grm. of iron ; therefore—

1 equiv. copper : 1 equiv. iron = copper : + iron.
31·7 : 28 = 0·1 : 0·0883.

Consequently, 0·1 grm. of copper corresponds to 0·0883 of iron, and likewise to 16·2 c.c. of protochloride of tin ; on the other hand, 0·1 grm. of iron corresponds to 18·34 c.c. of protochloride of tin, because 0·0883 : 0·1 = 16·1 : 18·34 c.c. protochloride of tin ; therefore, again, 0·0809 grm. of iron requires 14·837 c.c. of protochloride of tin, because 0·1 : 0·0809=18·34 : 14·837.

CALCULATION OF RESULTS.

	Protochloride of tin. c.c.
For copper and iron together	26·750
Deduct for iron alone	14·837
Leaves, for copper	11·913

25 c.c. of the solution therefore contains 0·0735 grm. of copper, because 16·2 : 0·1 = 11·913 : 0735. 4 grms. of the ore = 250 c.c. contain, accordingly, 0·735 grm. of copper, and 100 grms. of the ore contain, therefore, 18·38 per cent. of copper.

Observation on the Titration of Compounds of Copper containing Iron.—If the operator does not happen to have ready at hand a titrate of permanganate solution for the estimation of the iron, the titration of the fluid containing copper and iron can be readily performed in the following manner :—Precipitate, as above mentioned, by the aid of zinc and platinum, all the copper, etc. ; decant the supernatant fluid ; wash the precipitated metal (or metals) with distilled water, and dissolve these in sulphuric acid ; and estimate, next, in 25 c.c. of that solution (after previous addition of from 5 to 10 c.c. of pure hydrochloric acid), by titration with protochloride of tin solution, the copper directly without the necessity of determining the iron at all.

V. *Titration of a Compound of Copper which contains Nickel.*—Since the green color of the salts of nickel prevents the complete and perfect decoloration, by protochloride of tin, of a solution which contains copper and nickel together, the titration by means of the tin salt, as described, can be applied, but the end of the reaction must be tested for by the use of the solution of corrosive sublimate. In preference, however, to this I employ the following method :—The substance to be tested (about 4 grms.) is dissolved in nitric acid, or, if need be, in nitro-hydrochloric acid ; next, the greater part, but not all, the acid is saturated with carbonate of soda ; then add, after having diluted the fluid with cold water, an excess of freshly-precipitated carbonate of baryta, to which some chloride of ammonium is added, and which together are suspended in water. This milky fluid is thoroughly stirred through the metallic solution ; by this proceeding, a precipitate ensues, which contains all the copper as hydrated oxide and (if present) the iron also as hydrated oxide, while the nickel remains in solution. The precipitate is first washed by decantation, next collected on a filter, thoroughly washed, and, after having been re-dissolved in hydrochloric acid, titrated as above described. The presence of arsenic or its compounds does not in the least interfere with the process ; while, if cobalt happens to be present, which will, however, be only rarely the case, the treatment is the same as for nickel. By a series of test experiments and by comparison with gravimetrical analysis, the author states that he has found the process above described to be thoroughly reliable and to give accurate results.—*Chemical News.*

Address of Prof. Waterhouse Hawkins.

At the meeting of the Lyceum of Natural History on Monday the 6th inst., the following address was made by Mr. WATERHOUSE HAWKINS :

MR. PRESIDENT AND GENTLEMEN : On the 16th March, 1868, two days after my arrival in this country I had the pleasure, by invitation, of addressing this Association on Popular Education connected with science. I then quoted a paper I have now in my hand, namely, the printed programme of the Conference on Technical Education, held in England Jan. 3d and 4th, 1868, at the Society of Arts in London. The first item of that programme is :

"That to establish and maintain a system of technical education adequate to the requirements of arts, manufactures and commerce in the United Kingdom, the three following educational reforms should be effected ; 1st. In the universities, grammar schools, and other educational institutions for the upper and middle classes of society, instruction in science and art should be placed on the same favorable footing as other studies ; 2d. Efficient means of primary and secondary instruction should be brought within the reach of the working-classes everywhere, and encourgement should be given to the study of the elements of science and art in the upper classes of all primary schools which receive aid from the government ; and 3d. Special institutions for technical instruction, adapted to the wants of the various classes of society and to the industries of the country, should be established and maintained in the United Kingdom."

Being a member of that society, I was present at the discussion which then took place between some of our most celebrated men of high capacity. These views of popular education associated with science were then new to England. I have since found that you had in *part* anticipated this tardy action of the old country by your admirable, efficient and popular system for educating the people ; but I have also found that the *connection* of science with education is here, as at home, a barren field awaiting the action of the cultivator.

It was my good fortune on my arrival here to secure the attention of this old, established and most respectable society, the Lyceum of Natural History in New York, when your president and his coadjutors were pleased to sanction my then expressed views, by recommending me to bring them before the public of New York, which (as you may remember) I had the honor of doing on the 26th March, 1868, at the Cooper Union, to one of the largest audiences to which I ever had the pleasure of presenting myself. Nearly three thousand persons endorsed your opinion of the views I put before them, by inviting me to deliver a course of lectures on Natural History, which was eminently successful and was the introduction to my addressing many thousands of the most intelligent classes in the various cities between New York and Chicago. This successful expression of my opinion on the advantage of combining the natural sciences with education caused me to be employed by the then Commissioners of Central Park here in your city, where I was to revive the ancient history of the earth by the most veritable and substantial illustrations of its earliest inhabitants. A description of the nature of this engagement is contained in a brief letter in the 12th Report of the Board of Commissioners for Central Park, together with my reply, severally dated the 2d and 9th May. This correspondence is followed by a detailed report of the work intrusted to my design and execution up to the 19th Feb., 1869. This first report was hopeful to me and apparently satisfactory to the Commissioners and to the public at large. The first six months of my first year's engagement, as shown in the Report alluded to, were occupied in comparing the contents of your various museums and their collections, in reference to the fossil remains of ancient America ; as it had been decided by the Commissioners that my restoration should be confined in the first instance to those forms locally interesting. I was made aware of the barrenness of the spot on which I had to commence my search for materials by a little incident that occurred on one of the occasions when I was lecturing at Brooklyn, where a bone was placed in my hand by a gentleman, who was under the impression that its concave ends indicated its belonging to a reptile. I was anxious to compare it with a group of animals to which I supposed it to belong, but neither in Brooklyn nor in New York was to be found any specimen of Natural History, ancient or recent, with the exception of a skeleton of the Irish elk (which your President had then recently received at the School of Mines) and some bones of a horse at a celebrated veterinary surgeon's, who happened to be out, and his collection unaccessible, when I went to see it the day before I left New York. As New York was totally destitute of materials for my work, I found it necessary to commence the inspection of the museums of other cities. I examined the Natural History collections at Boston, Washington and Chicago, but it was not until I reached Philadelphia that I discovered any materials available for my immediate purpose. There I found some treasures in the way of fossils, and obtained the permission (freely granted) of the Trustees of the Academy of Natural Sciences, to have their fossils moulded, on condition that I should give them duplicate moulds of the principal examples. In this way I was enabled to secure to the Commissioners of Central Park, the complete skeleton (with my restorations of the missing parts made at Philadelphia.)

I returned to New York to commence my actual work in the Park on the 4th of December, and took possession on the 7th of the upper floor of the Arsenal Building as a temporary studio. My impatient desire to get to work struggled with the difficulties and apparent unfitness of the place. The upper floor of an old building required some caution, where to place a model in wet clay weighing several tons. By the 13th of March, 1869, the eighth month of my employment by the Commissioners, I had realized the blocking out of the rehabilitated

form of *Hadrosaurus*, in a recumbent position, in submission to the necessities of a low roof, under which the Hadrosaurus could not have assumed the walking attitude. The illustration in the 12th Report contains a true picture of my studio at the Arsenal in the month of June, 1869. The large model, then nearly completed, was afterwards moulded, which was a long operation with only one assistant and a laborer.

As the Commissioners had not decided on the site for the Museum building to protect these models and contain the geological illustrations accompanying them (as described in 13th Report, page 29), I was called upon by them, through the Comptroller, to make designs, plans and models to scale for the laying out of the then intended Zoölogical Gardens, known as Manhattan square, on the Eighth avenue, between Seventy-seventh and Eighty-first street. These plans and models, which are now in existence, for bear-pits, beaver-runs, and so on, occupied me until the end of the year 1869, which, of course, caused my restorations to remain in complete abeyance.

In January, 1870, the site for the Geological Museum was decided upon, and the foundations were commenced. As the Arsenal was required for the Museum of Natural History, it became necessary that my large models and the moulds should be removed; and a small temporary shed was built for them, with a forge (in reference to the iron frames of my illustrations). I now had hopes of the commencement of my real, proper work; for the Comptroller promised me that the platform (on which alone I could erect my models) might reasonably be expected from week to week. But sundry administrative changes were then taking place which appeared to postpone the advancement of this platform and the temporary shelter under which I could carry on my work through the summer and winter, until in the month of May the total change of the Commissioners again presented a barrier to the hoped-for commencement of my legitimate work. Early in June, the Vice-President of the Board of Commissioners informed me, that it was the wish of the Commissioners that I should give my attention to designs for the new Zoölogical Gardens and to sundry temporary buildings for improving the sanitary condition of the animals at the Arsenal. These buildings were to be erected in conjunction with the present Architect-in-Chief. It was very distressing to me to find my own occupation was still to be kept in abeyance, with less prospect of continuance than under the former Commissioners. But as I had reason to believe that the first cost of the intended Museum was one of the chief reasons for its delay, I presented a report to the Commissioners for modifying the design, so as to lessen the expense to a very considerable extent. This report, if I may trespass a little longer on your patience, I will now read:

REHABILITATED FORMS OF ANCIENT AMERICAN GIANTS, TO WHICH IT IS PROPOSED TO ADD A GRAND AQUARIUM, TOGETHER WITH A FISH-HATCHING APPARATUS, WITHIN THE SAME SHELTER.

PALEONTOLOGICAL STUDIO, CENTRAL PARK, September 5, 1870.

HENRY HILTON, Esq., Vice-President, Ex. Com., D. P. P.:

SIR: In the twelfth Report, page 131, it is stated: "In consideration of the variable climate and the duration of the winter in New York, it has been resolved by the Commissioners that the restoration of gigantic animals shall be erected within the shelter of a permanent building." This permanent building was commenced in January of the present year, with the intention of so quickly preparing the central platform on which the rehabilitated forms of the giant animals of ancient America were to be placed, that at the time I had reason to expect the said platform would have been ready in three or four weeks, when, with a temporary protective shed, I could have immediately commenced the modelling and casting of those forms for which I have the moulds prepared, while the architectural portions of the building should have been carried on over the temporary shelter of my works. Finding now that not only the required platform, but also the massive foundations of the structure are completed, I believe it to be my duty to renew the requisition for temporary shelter for the continuance of my work, as accepted and agreed to by the Commissioners of Central Park. If it be a structure for mere shelter, all results might be obtained in a building that was comparatively inexpensive, such, for instance, as a wooden structure with iron supports, or one of rough-hewn stone of the utmost simplicity of design, suitable to the ponderous character of the animals sheltered, while the interior should be but a rocky chamber or cavern, wherein the geological specimens of rock composing it shall be geologically arranged, so as to explain their relationship to the animal forms exhibited. This united with the pictorial representations of the natural condition of the rocks, displaying the connection between the animal and vegetable kingdoms of that time, would convey information in a most complete and consecutive manner. Then, if to these instructive lessons in geology were added a grand aquarium for the display of examples of living fish and other inhabitants of the waters, with the artificial breeding and growth of the fish, the whole would be in such perfect harmony, and would so fitly combine entertainment with instruction, that it would enable the juvenile portion of this vast city to be instructed in natural history in the easiest form, through the medium of the eye, during the winter, and thus would supply a want long felt by the citizens of New York. This plan of the aquarium has been tried at Hamburg, and has met with such great success that the directors of the Crystal Palace, England, have now commenced a similar work, as an attraction of *considerable pecuniary* advantage. The museum in question possesses this great advantage of situation, that the visitors would have entrance and exit at Eighth avenue, where the traffic is already arranged, during the winter, without interfering with the rules respecting the closing of the Park. Yours faithfully,

B. WATERHOUSE HAWKINS.

On the 22d of December, 1870, I received the following notice from the Department of Public Parks:

"SIR: At a meeting of the Department of Public Parks, held on the 20th inst., the following resolution was adopted:

'*Resolved*, That the existing arrangements for the services of Prof. B. WATERHOUSE HAWKINS, connected with the establishment of a Paleozoic Museum, or otherwise, be discontinued until the further action of the Board.'

"Very respectfully, GEO. VAN NEST, Clerk D. P. P.
Prof. B. WATERHOUSE HAWKINS."

Thus, at the present critical juncture of educational progress was a very summary ending put to my hopes of realizing, for a second time, the most efficient material for object-teaching, in connection with natural history and geology.

[After remarks by several other gentlemen, the Lyceum adopted two resolutions, which are quoted on our editorial page.—ED.]

Alleged Action of Cold Rendering Iron and Steel Brittle.

WE publish together the following papers, by eminent scientists, in reply to the paper of Mr. BROCKBANK, which will be found in another column.

THE PROPERTIES OF IRON AND STEEL.

A paper "On the Properties of Iron and Steel as applied to the Rolling Stock of Railways," by Sir W. FAIRBAIRN, Bart, LL. D., F. R. S., etc., was also read. The writer said: Dr. JOULE communicated to me the discussion which took place at the last meeting of the Society, on the question of the effects of intense cold on steel tyres. This enables me to refer to a series of experiments which had for its object the effects of various degrees of temperature on wrought iron. These inquiries are to some extent analogous to the cause of the recent accident which occurred on the Great Northern Railway, near Hatfield, by the breaking of a steel tyre, which caused the death of a number of persons. It has been asserted, in evidence given at the coroner's inquest, that the breaking of the steel tyre was occasioned by the intensity of the frost, which is supposed to render the metal brittle, and of which this particular tyre was composed. This is the opinion of most persons, but, judging from my own experience, such is not the fact; and provided we are to depend on actual experiment, it would appear that temperature has little or nothing to do with it. Some years since I endeavored to settle this question by a long and careful series of experiments on wrought iron, from which it was proved that the resistance to a tensile strain was as great at the temperature of zero as it was at 60 degs. or upwards, until it attained a scarcely visible red heat. To show that this was the case, and taking, for example, the experiments at 60 degs., it will be found that the mean breaking weight, in tons, per square inch, was in the ratio of 19.930 to 21.879, or as 1 is to 1.098 in favor of the specimens broken at the temperature of zero. The generally received opinion is, however, against these facts, and it is roundly asserted that the strength of iron and steel is greatly reduced in strength at a temperature below freezing. The contrary was proved to be the case in wrought-iron plates, and assuming that steel follows the same law, it appears evident that we must look for some other cause than change of temperature for the late fracture of the tyre on the wheel of the brake-van of the Great Northern Railway. The immense number of purposes to which both iron and steel are applied, and the changes of temperature to which they are exposed, renders the inquiry not only interesting in a scientific point of view, but absolutely necessary to a knowledge of their security under the various influences of those changes; and when it is known that most of our metal constructions are exposed to a range of temperatures varying from the extreme cold of winter to the intense heat of summer, it is assuredly desirable to ascertain the effects produced by those causes on material from which we derive so many benefits, and on the security of which the safety of the public frequently depends. It was for these reasons that the experiments in question were undertaken, and the summary of results are sufficiently conclusive to show that changes of temperature are not always the cause of failure, as that which occurred near Hatfield on the Great Northern Railway. That such is the fact I may adduce several accidents of broken tyres, all of which occurred during the spring and summer months when the temperature was high. One of them occurred on the Lancashire and Yorkshire Railway in the summer of last year, when the temperature was 50 degs. to 60 degs. above freezing. I could enumerate others in which the winter frosts had nothing to do with the fractures which ensued. It might have been satisfactory to have shown the process by which the following results were obtained; suffice it to observe that all the specimens were torn asunder with and across the fibre in oil and water baths, and those under the freezing point were made in a snow bath reduced to zero. The experiments are quite conclusive as regards the strength of wrought-iron plates, till they approach red heat. At that temperature nearly one-half the strength is lost; it becomes exceedingly ductile, and may be drawn to a considerable extent in the direction of the fibres before it breaks. Another series of experiments were made on wrought-iron bars, which indicated somewhat different results. In these experiments the specimens from the same works attained the maximum of strength, and gave at a temperature of 415 degs., a resistance of 39.072 tons and at zero and 60 degs. there were little or no differences, but the resistance was increased from 28.419 at zero and 60 degs., to 39 tons per square inch at 415 degs. This may, however, be accounted for from the increased manipulation of rolling where the fibre is drawn and elongated to a much greater extent than in plates. This does not, however, affect to any great extent the ratio of compression and extension as regards the effects of temperature, although I should be inclined to take the experiments on plates before that on bars, as analagous to the broken tyre, which, it must be borne in mind, is without weld and perfectly homogeneous. The danger arising from broken tyres does not, according to my opinion, arise so much from the changes of temperature as from the practice of heating them to a dull red heat, and shrinking them on to the rim of the wheels. This, I believe, is the general practice, and the unequal and, in some cases, the severe strains to which they are subject has a direct tendency to break the tyres. To show how easily this may be effected, let us suppose that a tyre, 2 ft. 6 in. or 3 ft. diameter, is shrunk on to a wheel 1-10th in. larger than the tyre, it then follows that the tyre in cooling must be elongated to that extent, with a strain, equivalent to the force of the shrinkage, and calculated to produce that amount of molecular disturbance. It may be more or it may be less, but supposing the strain to be one-half or three-fourths of that which would break the tyre, it then follows that the constant action of its irregular motion on the rails must ultimately lead to fracture.* I am not surprised that this should be the case, as most, if not the whole, of railway tyres, excepting those on engines and tenders, are not turned but selected by hand, heated and shrunk upon the wheels with every degree of tension, as suits the convenience of the workmen. So long as this process is pursued, the public will be exposed to the risk of broken tyres. What is required in this description of manufacture is, that the rim of the wheel and the inside of the tyre should be turned to a standard gauge, accurately calculated to give the required amount of tightness with a larger margin of strength; and this done, we should attain greatly increased security to the public, and a great saving in wear and tear—to say nothing of the large sums expended by companies in the shape of compensation for injuries and loss of life.

ON THE ALLEGED ACTION OF COLD RENDERING IRON AND STEEL BRITTLE.

A paper "On the Alleged Action of Cold in rendering Iron and Steel Brittle," was read by Mr. S. P. JOULE, D.C.L., F.R.S., &c., Vice-President. As is usual in a severe frost, said Mr. JOULE, we have recently heard of many severe accidents consequent upon the fracture of the tyres of the wheels of railway carriages. The common-sense explanation of these accidents is, that the ground being harder than usual, the metal with which it is brought into contact is more severely tried than in ordinary circumstances. In order apparently to excuse certain railway companies, a pretence has been set up that iron and steel become brittle at a low temperature. This pretence, although put forth in defiance, not only of all we know of the properties of materials, but also of the experience of every-day life, has yet obtained the credence of so many people that I thought it would be useful to make the following simple experiments: 1. A freezing mixture of salt and snow was placed on a table. Wires of steel and of iron were stretched so that a part of them was in contact with the freezing mixture, and another part out of it. In every case I tried the wire broke outside of the mixture, showing that it was weaker at 50 degs. F. than at about 12 degs. F. 2. I took twelve darning needles of good quality 3 inches long, 1-12 inch thick. The ends of these were placed against steel props, 2⅛ inches asunder. In making an experiment, a wire was fastened to the middle of a needle, the other end being attached to a spring weighing machine. This was then pulled until the needle gave way, Six of the needles, taken at random, were tried at a temperature of 55 degs. F., and the remaining six in a freezing mixture, which brought down their temperature ot 12 degs. F. The results were as follows:

Warm needles.	Cold needles.
64 oz. broke	55 oz. broke
65 " "	64 " "
55 " "	72 " "
62 " "	60 " bent
44 " "	68 " broke
60 " bent	40 " "
Average 58¼	Average 59⅛

I did not notice any perceptible difference in the perfection of elasticity in the two sets of needles. The result, as far as it goes, is in favor of the cold metal. 3. The above are doubtless decisive of the question at issue. But as it might be alleged that the violence to which a railway wheel is subjected is more akin to a blow than a steady pull; and as, moreover, the pretended brittleness is attributed more to cast-iron than any other description of the metal, I have made yet another kind of experiment. I got a quantity of cast-iron garden nails, 1¼ inches long, and ⅛ inch thick in the middle. These I weighed, and selected such as were nearly of the same weight. I then arranged matters so that by removing a prop I could cause the blunt edge of a steel chisel, weighted to 4 lbs. 2 ozs., to fall from a given height upon the middle of the nail as it was supported from each end, 1 1-16th inches asunder. In order to secure the absolute fairness of the trials, the nails were taken at random, and an experiment with a cold nail was always alternated with one at the ordinary temperature. The nails to be cooled were placed in a mixture of salt and snow, from which they were removed and struck with the hammer in less than five seconds. Up to Series 10 each set of 16 nails was made up of those or the previous set which were left unbroken, added to fresh ones to make up the number: Series 1. Temperature of eight cold nails, 10 degs.; of eight warm, 36 degs.; height of fall of hammer, 2 inches. Result: No nails broke. Series 2. Temperature of eight cold nails, 14 degs.; of eight warm ones, 36 degs.; fall of hammer, 2½ inches. Result: No nails broke. Series 3. Temperature of eight cold nails, 2 degs.; of eight others, 36 degs.; fall of hammer, 3 inches. Result: One cold nail broke; no warm one broke. Series 4. Temperature of eight cold nails, 2 degs.; of eight others, 36 degs.; fall of hammer, 3½ inches. Result: Two cold nails broke; one warm one broke. Series 5. Temperature of eight cold nails, 2 degs.; of eight others, 36 degs.; fall of hammer, 4 inches. Result: One broke of each sort. Series 6. Temperature of eight cold nails, 0 deg.; of eight others, 38 degs.; fall of ham

* From long-continued action under strain, it has been proved that it is only a question of time when rupture takes place, as repeated increase and diminishing of the same load ultimately leads to fracture.

mer, 4½ inches. Result: One broke of each sort. Series 7. Temperature of eight cold nails, 2 degs.; of eight others, 36 degs.; fall of hammer, 5½ inches. Result: No cold nails broke; one warm nail broke. Series 8. Temperature of eight cold nails, 2 degs.; of eight others, 40 degs.; fall of hammer, 6½ inches. Result: Two cold nails broke; one warm nail broke. Series 9. Temperature of eight cold nails, 2 degs.; of eight others, 40 degs.; fall of hammer, 7½ inches. Result: Three cold nails broke; three warm nails broke. Series 10. Experiment with the ten left in the last; temperature of five cold nails, 2 degs.; of the five others, 40 degs.; fall of hammer, 8½ inches. Result: Two cold nails broke; one warm nail broke. Series 11. Experiment with the six left from the last; temperature of three cold nails, 3 degs.; of the other three, 40 degs.; fall of hammer, 10 inches. Result: Two cold nails broke; three warm nails broke. Series 12. Experiment with fresh nails: Twelve cooled for four hours to 3 degs.; twelve others, 41 degs.; fall, 7 inches. Result: Seven cold nails broke; eight warm nails broke. The collective result is that 21 cold nails broke and 20 warm ones. The experiments of LAVOISIER and LAPLACE, of SMEATON, of DULONG and PETIT, and of TROUGHTON, conspire in giving a less expansion by heat to steel than iron, especially if the former is in an untempered state. Such specimens of steel wire and of watch-spring as I possess expand less than iron. But this, as Sir W. FAIRBAIRN observed to me, would in certain limits have the effect of strengthening rather than of weakening an iron wheel with a tyre of steel. The general conclusion is this: Frost does not make either iron (cast or wrought) or steel brittle, and that accidents arise from the neglect of the companies to submit wheels, axles, and all other parts of their rolling stock to a practical and sufficient test before using them.

Darwin's Hypothesis.

A LECTURE upon this subject was delivered on Saturday evening, March 11, at the Cooper Institute, by ROSSITER W. RAYMOND, Editor of the ENGINEERING AND MINING JOURNAL. The following is an abstract of his remarks:

The lecturer explained at the outset that he did not propose to attack or defend the Darwinian hypothesis. He should endeavor to state it in outline, so as to give a general idea of its nature, grounds and bearings, without declaring his own opinion upon the subject either way. After a few words about Mr. DARWIN, and an explanation of the nature and use of a hypothesis, in the deductive method of reasoning, he described the grouping of the organic world into kingdoms, branches, classes, orders, families, genera, species and individuals, and the extent to which these distinctions are founded in nature. A group of individuals, which are essentially alike, though not exactly so, which reproduce their like, do not freely breed with other groups, or, if crossed, produce infertile offspring, is called a species; and it has been held that since each species perpetuates itself by reproduction, so each species must have descended from a specially created ancestral pair.

Within the limits of a species, however, varieties occur, first in individuals, and then, if these individuals are carefully bred together, in whole generations of them. Artificial varieties, breeds and races have thus been produced by man, sometimes differing from each other so widely that they would be called species if they occurred in a wild state, and if they did not breed freely together. The art of breeding, as practiced by gardeners and stock-fanciers, consists principally in a skilful selection of individuals possessing desired peculiarities of form, color, strength, speed or habits, and the persistent breeding of these, without intermixture of inferior stocks.

Now Mr. DARWIN holds that species have been produced in nature, not by the creation of a pair of progenitors for each species, but by a process analogous to the production of varieties by human selection; and this process he calls natural selection.

The following scheme of facts and deductions is essentially that of Mr. ALFRED WALLACE, an eminent naturalist, and to some extent an original co-author of the hypothesis called DARWIN'S.

1. All plants and animals tend to increase in geometrical ratio. Even the slowest breeders produce young more numerous than their parents, and would soon, if increasing at the normal rate, overcrowd the world. This acknowledged fact may be called the law of multiplication.

2. Nevertheless, it is evident that the numbers of each species do not increase at this rate, but remain more or less stationary for long periods. This is the law of population.

3. It follows that the larger number of individuals born must die without reproducing young, and the existence of the survivors is a contest against natural conditions and enemies. Accident, severities of climate, enemies, and lack of food, are causes which may destroy individuals at any stage of existence, from the embryo or seed to the period of natural death. Difficulties of reproduction are perhaps less important, except for plants. This contest is called the struggle for life; and it is held that, on the average, those individuals which survive must be in some way the fittest for the peculiar battle or competition to which they are exposed. Fitness does not necessarily imply strength. It may consist in any quality or combination of qualities giving the individual advantage over his fellows, exposed to the same enemies and natural conditions, and seeking the same food.

4. Here comes in the observed fact that the individuals of every species do differ, no two being exactly alike. This is called the law of variety.

5. But an equally universal fact is the inheritance of peculiarities from one generation to another; and the possibility of making these peculiarities more or less permanent by breeding. This is the law of transmission.

6. Of those individuals which survive the causes of premature death, the offspring will probably vary, but a portion will reproduce the peculiar characteristics of the parents. This portion will be most likely to survive, as the parents did, and will transmit the advantageous peculiarities with still greater force to their descendants, and the continuance of this process for many generations effects the survival of the fittest types, or what is called natural selection. The groups thus surviving, and acquiring permanent advantageous peculiarities are called species. This subject was discussed at some length by the lecturer.

7. But this equilibrium among the numbers of a species, the conditions of its existence and the numbers of competing or hostile species, is not permanent. The conditions are constantly changing. Sudden changes, such as floods, droughts, or the encroachments of agriculture on the wilderness, affect principally the numbers of a species, and may even produce its extinction. But the slower changes of surface and climate of which geology gives evidence, would give time for the differentiation of existing forms, and thus lead to the origin of new species.

The hypothesis then is, that variation under altered conditions, combining with multiplication and controlled by the limit of population, produces transmitted peculiarities, which become the origin of species.

The lecturer then proceeded to give many illustrations of observed facts in natural history, for which this hypothesis offers plausible explanations, and added a summary of the chief difficulties in the way of its adoption, closing with a reference to the mistaken use of the Bible as a barrier to the freedom of honest scientific inquiry, an earnest acknowledgment from the Christian stand-point of the divine origin of all truth, and a final declaration that the great moral revelations of the Bible are far above the reach of physical science, in a realm, not of selfish competition, but of duty, heroism, charity and self-sacrificing love; the strong not "surviving," but bearing the burdens of the weak; God himself sympathizing with his creatures; immortality, over-arching the struggle between life and death.

It is understood that Mr. RAYMOND is not a follower of DARWIN; but the most eager Darwinian could not complain of the fair and impartial statements of that hypothesis given in the lecture. Its application to the origin of man was but briefly noticed, and merited rebuke was bestowed upon those who attempt to meet it with vulgar ridicule, even the great AGASSIZ, who demeaned himself to protest against being descended from a monkey! The lecturer said, in substance, "the application of this theory to the origin of MAN is not yet accepted, even by Darwinians; but it must be fairly met and examined. It cannot be put down with ridicule."

We understand that the trustees of the Cooper Union propose to include in their course, next year, lectures from eminent persons, both in favor of Darwin's hypothesis and against it. In that case, they have made a good beginning in the presentation of this preliminary statement of the case.

MINING SUMMARY.

California.

GRAVEL MINING IN NEVADA COUNTY.

The San Francisco *Bulletin* of the 27th ult., contains the subjoined. "The impression is probably general among those who have never travelled through Nevada county that its best mines are of quartz, and that its richest portion is around Grass Valley and Nevada. Both these impressions, if not entirely erroneous, are at least so in part. Despite the fact that Nevada county saw the birth of quartz mining, and has still some of the best mines of that character in the State, it is a fact that it has not been over half prospected, much less thoroughly worked. There are districts in which dozens of quartz ledges have been discovered, but of which number a few only have been partially worked. Some of the ledges promise even better than those of Grass Valley.

Gravel mining on the great blue gravel or old river beds of Nevada county has paid better proportionately than quartz, and is growing in favor; but the cost of sinking shafts or running tunnels, varying from $2 to $15 per foot, precludes poor men from doing anything, no matter how good the prospects may be. The Nevada county papers bemoan that mineral districts at far distant parts of the coast are known, and interests held in them, by San Franciscans, who know little or nothing about the undeveloped resources of a country which lies at their doors, and which, in point of size, would vie with some of the New England States. Gravel mining offers perhaps the widest field for investment in Nevada county at present, as well as of the adjoining counties of Sierra and Plumas; and another important fact, to a people who are notably impatient for returns and niggardly of expenditures, is, that the opening of a gravel lead costs less than the development of a quartz mine, while the work can be performed more rapidly,

The leading gravel claims on Lowell Hill, above Little York, never promised or were generally doing so well as at present; while the historical Alta Hill, Grass Valley, from the gravel claims of which over a million dollars have been taken out, is again a seat of interest and excitement, the Alta Company Number Three having lately had evidence that they are on the track of the old channel, out of which so much precious metal has been extracted in the past. Mining is now kept up there the twenty-four hours through, and Alta Company Number Four only awaits the result of No. Three's sinking to go to work with equal energy. It is really a fact that English capitalists know more, and have invested far more money, in mines in Nevada county within three years, than Americans. It is well enough for us to invest in Utah and Nevada, but we should not overlook, as we have been largely doing, if not entirely, the claims of a country which the railroad has brought beside us, and which has so far proven the most reliable in the State. In saying this we do not mean to disparage several other counties in which extensive and valuable gravel deposits are known to exist, and have been more or less developed. We use Nevada county as an illustration simply because it has been fortunate in retaining a large and energetic population, and that, owing to this circumstance, and to its situation between certain great lines of travel, it has been more explored and described than some others. Yuba, and Placer, and El Dorado have their famous gravel districts and excellent quartz lodes, and Butte will yet be celebrated for the wealth and extent of its deep deposits, which only await water and capital for their development; and we suggest that in any of these counties, as well as in still others lying north and south of them there are great natural sources of wealth which invite judicious exploration and investment.

New Mexico.

THE RALSTON MINES.

The silver mines in Ralston, New Mexico, have created some excitement and comment. The Colorado *Register* has the following private letters, written to Captain R. C. VOSE of Central city. They are written by well-known gentlemen of New Mexico, and will be read with interest. The first, from Hon. W. L. RYNERSON, is dated Las Cruces, February 2, 1871. We quote as follows:—"Ralston mines, as you know, are situated near the southern overland road, between Loidsendorf's wells and Barney's Station, some fifteen or twenty miles eastward from Stein's Peak, or Doubtful Pass. Many men, who ought to be good authority, have great faith in them, but I have grave doubts. At any rate, it will require immense capital to work them. The Silver City mines are good; no mistake about it. They are situated some eight or ten miles to the southwest of Pinos Altos, about thirty miles to the northwest of the Rio Miembres crossing, and about eight or nine miles to the west of Fort Bayard. The ore is rich and quite extensive. Mr. CARASCO, of this place, is at these mines, and is engaged in smelting out silver in his rude and tedious process. He smelts out silver at the rate of about $100 per ton, of each ton of ore, and does not save half the silver. In some instances the ore goes as high as one dollar of silver to the pound of ore; of course this is picked ore. Parties in New York have a mill on the way for these mines, and it is reported that Mr. MAXWELL has a mill on the way also. I have an engine and blower on the ground, which I shall put to work smelting in a few days. The mills I have spoken of are to be on the ground and to be at work by May next. Only a portion of the ore is what is called smelting ore. It is necessary to treat the greater portion by amalgamation process, not the rebellious. I have just come from these mines, where I saw about $500 worth of silver that CARASCO had smelted out and refined by his hand-bellows furnace. Now, you know that mining is a hazardous business at best. No matter how rich these miners are, nine out of ten men who come here will not make money and will be disappointed in them. Persons who get mills to work will make money, and the mines will furnish employment for a great many men. Of all this I need not tell you, because you know from experience what mining is in any country. Stage fare from Santa Fe to Las Cruces is $75, from Las Cruces to Silver City $28, and from Las Cruces to Ralston $40."

The second letter, from Hon. JOHN LEMON, probate Judge of Dona Anna County, is written from Mesilla, February 7. He says: "I will give you my candid opinion of the new silver mines at Ralston and Silver City. That they are rich is indisputable, and as extensive as rich. At the present time scarcely anything is being done toward developing them, on account of the want of capital—capital to put up mills, to explore, prospect, prove, and open the great extent of country in which the mines are situated. Capital will give employment to many persons who at present cannot get work, and will also help the migration which must naturally come to this country, and through them (the emigrants) conquer the hostile and revengeful Apaches, who now hold so much of our undisvovered mines, and are a terror to those already found. A few days ago I saw eighteen pounds of pure silver, which were brought from Silver City, extracted from the rock by the rude and crude process of the Mexican style of smelting. With mills and workmen, which a judicious use of capital will put in the mines, it is impossible for me to estimate the production of these mines at Ralston and Silver City. I have no doubt that if you should visit these mines you could purchase an interest in many of them. You have a great extent of country, similar to that around Ralston, in which to find new mines, and you have as much right and chance to find them as others. I do not advise persons to rush there with the expectation of making money by buying or selling claims, or of taking it out of the rock. What I say is, that there is a large amount of silver, etc., in the rocks of Grant county, N. M., but it requires improved machinery, skillful hands, energy and patience, all directed by a liberal capital in the hands of intelligent men, to get it out of the same rocks; and when we shall have all this, at and around Ralston and Silver City, then, and not till then, we can say to the people, come, 'Seek and ye shall find."

Pennsylvania.

THE PITTSBURGH REFINERIES.

The following is a list of the most important refineries of Pittsburgh, with an approximate estimate of refined oil turned out by them weekly;

Montheimer, Koehler & Co.	1,000 barrels.
Braun & Wangener	1,000 "
Lockhark, Frew & Co.	3,000 "
Livingston & Bros.	500 "
McKelvey Bros. & Co.	1,200 "
Citizens' Oil Refining Company	2,500 "
Forsyth & Bros.	1,500 "
H. Koehler & Co.	500 "
National Refining and Storage Company	1,000 "
Standard Oil Company	1 000 "
Liberty Oil Works	500 "
Fawcetts, Logan & Stockdale	1,200 "
Commercial Oil Works	1,200 "
Warmser, Myers & Co.	500 "
Fairview Oil Works	1,000 "
Mentzer, Helper & Co.	500 "
Kilpatrick & Co.	1,000 "
Kilpatrick & Lyons	1,000 "
Total per week	20,100 "

The refining capacity is nearly four times this amount. The shipments of refined average between two and three thousand barrels per day.—*Titusville Herald.*

Nevada.

MINES AT COLUMBUS.

A correspondent of the Sacramento *Record* sends the following item of mining news: "New veins are being discovered every few days. They are small but rich, and an experienced judge of such matters considers that they can be worked to advantage without any great outlay of capital or dangerous speculation. Horn silver, ruby silver and most of the other kinds of silver ores are abundant. It is expected that MARDEN will start his mill early in February. Like most new camps, there is very little coin among the inhabitants; but there seems to be a calm confidence among them all which augurs well for the future success of the camp. As little or nothing is raised there, living is rather dear—board $9 per week."

MARKET REVIEW.

The Coal Trade.

NEW YORK, March 10, 1871.

WHOLESALE.—Affairs have not materially changed since our last writing. Shipments of Anthracite Coal to this market are very small, and sales are mostly confined to the balance of stock on hand which is gradually disappearing. The difficulties in the various mining centres seem to be no nearer a settlement, though there have been negotiations to that end by both operators and miners and laborers. The daily papers have so thoroughly exhausted themselves of their "wild ideas" and speculations, that instead of one and one-half columns of matter daily on the subject, they are content now to give their readers one-eighth or sixteenth of a column, and that mostly telegraphic news, consisting of rumors of resumption. Most of them are now vain enough to suppose that the general onslaught made by them has averted a general famine and a panic in coal, whereas in fact they have been the means of enhancing its price.

Many wealthy and well-to-do families, who have had a sufficient supply laid in their cellars at low rates, became fearful lest they should run short, and have been frightened into putting in a ton or two extra at high prices, thus decreasing the supply on hand unnecessarily and aiding materially in advancing the price. Thus the daily papers have produced just the opposite effect aimed at, and caused the "poor man" who was unable to lay in his winter's stock in consequence of lack of funds, to pay two or three dollars more for coal than was necessary. About on the same principle, they have been howling about the removal of the duty on coal, until suddenly they awake to the fact that Nova Scotia is situated so far north of us that "Jack Frost" would hold her in his icy grasp until the middle of May, hence no relief could be expected from there—tariff or no tariff. It has also suddenly come to their minds that "self-preservation is the first law of nature," and that as the removal of the duty would only make bankrupt our American bituminous coal dealers, without reducing the price of anthracite coal. This method of enriching "John Bull," while sinking millions of American capital, can hardly be popular with the public. The papers consequently, one by one, quietly have dropped the discussion of the question.

While drifting away from the questions noted above, they have, during the past week, been endeavoring to make the public believe that, in a few days, "all will be well," "*one* or *two* mines have resumed," and plenty of coal will be immediately forthcoming. The fact is, we are not one jot nearer a settlement than we were two weeks ago; and as for *one* or *two* mines bringing us relief—why, *twenty-one* or *twenty-two*, in full operation, would, with the combined assistance of the transportation companies (which our readers know are in direct opposition), scarcely cause a ripple on the broad ocean of the coal trade. Of course our readers are too well posted to be led away by any such silly nonsense as the daily papers publish regarding coal affairs, and we merely refer to them as part of the "chit chat" of the week.

Last week we commented favorably upon our Cumberland coals, for manufacturing, steamer, or family use. In conversation with Captain BOND, of the steamer "Continental," of the New Haven line, we were informed that there was a great saving in using the Cumberland coal, which he has permanently adopted. First, it required very little wood to start with; his estimated saving in this respect was some $2,500 per annum. Secondly, he uses but two tons of Cumberland coal where he formerly used three of anthracite, showing a great advantage when both are the same in price, and an equal advantage when anthracite is six dollars per ton and Cumberland eight dollars. Thirdly, greater rapidity in firing up.

The above facts merely endorse the claims we made for the Cumberland coals last week, and are testimony in sustaining us in our statement, that our Cumberland coals had played second fiddle to the anthracite long enough. Our readers should loose no time in placing these facts before our leading manufacturers and other large consumers of coal, and should immediately secure a few cargoes of Cumberland coal for the purpose of supplying their wants.

Our readers might ask us, if the soft coals are so valuable, why have they not pushed themselves to notice and been more sought after in the past? The trouble is twofold: first, our stoves, ranges, grates, etc., for families, are not exactly suitable for burning this coal, although they can be used. The same may be said of the grate bars of our boilers. Secondly, the supply has not been steady and certain; our Cumberland mines have always been an unprofitable investment, and where there has been some $20,000,000 invested in the opening and improving of these mines, one hundred thousand dollars have not been returned in dividends. The reasons for this are that the anthracite coals have the run of the market, are more cleanly for domestic purposes, and are produced generally at from $5,00 to $6,50, while the great distance that the Cumberland mines are situated from tide-water, makes it impossible to produce the coal lower than $7,50 to $8,00 per ton, delivered alongside at New York. Competition with Nova Scotia and foreign coals has also greatly interfered with their prosperity; and herein lies a just reason for retaining the duty on coal, as in effect it can only tend to a complete destruction of our Cumberland mines, in which at this time we find "a friend in need." A true American spirit to protect "our own," and particularly when that one is weak and sickly, calls upon us to raise our voice in its defence, and protest against the removal of the duty on coal.

In conclusion, we would inform our readers that having scarcely any coal for sale, the habituitees of Trinity Building are enjoying a peaceful holiday. Gatherings here and there—in this office or that—they may be found speculating on the "coal question," and almost every "intelligent dealer" (as our city press style them) has his own peculiar views. Many of them have been specially concocted for the papers, and await the arrival of some "interviewer" of the *Herald* or *Post*. Much amusement is often caused at the "member of the press," who, having eagerly devoured the dose prepared departs, and the leader of these "shaving shops" cries out hilariously "next."

PRICES.—CUMBERLAND.—The increased demand fer Cumberland coal has raised the expectations of dealers somewhat, yet it is offered at low figures compared with Anthracite. $7 75 to $8 50 may be considered a fair quotation.

ANTHRACITE.—The Schuylkill canal and Delaware and Raritan canal are open, and in consequence of the release of the coal up to this time locked up in them by the ice, market prices are not as firm as last week; $9 50 to $10 50 would be fair quotations. There are not many buyers anxious to purchase at these prices.

RETAIL.—The warm weather of the past few days has caused a little falling off in the demand. The Delaware and Hudson Company are selling Lackawanna coal in small lots—one ton at a time—at $8 50 to $9; other dealers ask from $10 to $12, delivered.

FREIGHTS.—As the spring days open our rivers and bays, vessels will become more plentiful; but even were there a good demand, rates could not advance. There has been an extra call for steamers and sailing vessels for Baltimore and Alexandria, to transport Cumberland coal, at about $3 35 to $2 50, an advance of 25 to 50 cents.

Anthracite Coal Trade for 1870 and 1871.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending March 4, 1871, compared with week ending March 5, 1870.

COMPANIES.	1870. WEEK.	1870. TOTAL.	1871. WEEK.	1871. TOTAL.
*Phila & Reading R. R.	34,971	543,359	26,297	580,271
†Schuylkill Canal	....	34 373	....	36,225
Lehigh Valley R. R.	23,333	596,035	10.044	356,520
Lehigh & Sus. R. R.	10,422	141,302	6,216	66,562
†Lehigh Canal	....	....	....	.....
Scranton North	13,185	109,869	....	.....
" South	31,703	275,7.6	....	....
Penn. Coal Co., rail	19,920	154,835	....	2,760
" " " canal	....	....	....	....
Del. & Hud. Canal Co.	....	....	....	....
" " East	6,198	85,050	....	48,332
" " West	2,457	17,165	....	12,721
South	4,520	24,536	....	....
Shamokin	4,053	48,385	14,060	68,717
Trevorton	99	3,319	....	....
Lykens Valley Coal Co.	....	....	....	10,046
Wyoming South	....	....	....	....
Wyoming North	....	....	....	....
P. N. Y. C. & R. R. Co.	5,236	56,937	324	34,514
Williamstown, Col'y	5,509	33,916	....	....
Big Lick Col	....	....	....	12,505
Total	161,506	2 124 867	57,551	1,228,553
1870	57,541	1,228 553		
Increase week and year	103,965	896,314		

* Less coal transported for Company's use and Bituminous coal.
†Closed for the season.

Bituminous Coal Trade, 1870 and 1871.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending March. 4, 1871, compared with week ending March 5, 1870.

COMPANIES.	1870. Week.	1870. Year.	1871. Week.	1871. Year.
B. & O. R. R.	4,896	78,002	29,473	139,722
C. & O. Canal	....	....	....	....
H. & B. T. R. R.	5,451	34,571	7,300	41,826
Harrisburg & D.	8,531	85,993	11,505	75,047
L. V. R. R.	....	3,310	....	5,484
P. & N.Y.C. & R. Co.	50	38,830	4,186	51,728
Total				

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending March 4, 1871, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt
Total Wyoming	950 00	70,282 06
" Hazleton		205,234 14
" Upper Lehigh		442 06
" Beaver Meadow	2,894 02	72,661 10
" Mahanoy	7,160 05	67,662 12
" Mauch Chunk	209 14	1,507 15
Total Anthracite	11,254 01	417,791 03
Bituminous Coal from all sources		5,484 00
Total by rail and canal	11,254 01	423,275 03
Same time last year	30,529 03	677,533 10
Increase		
Decrease	19,275 00	254,258 07
Forwarded East from M'h Chunk by rail	10,044 16	356,520 13
Same time last year	23,333 15	596,035 03
Increase		
Decrease	13,288 19	239,514 10

RECAPITULATION.

Forwarded East from M'h Chunk by rail	10,044 16	356,520 13
To N. C. R. R., at Mount Carmel		18 00
Forwarded North from L. & B. Junction	324 18	34,109 13
To L. & S. R. R. at Packerton for rail	5 14	1,922 19
Delivered at M'h Chunk		
Delived on line of road above Mauch Chunk	16 10	356 01
Delivered above M. Chunk	110 06	3,263 03
Delivered above M. Chunk for use of L. V. R. R.	751 17	12,014 03
To L. & S. R. R., at P'n Hav., for railroad		94 10
Do. for canal		7,060 19
At M. Chunk for canal		2,431 02
Total Anthracite	11,254 01	417,791 03
Bituminous Coal		5,484 00
Total all kinds	11,254 01	423,275 03

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, March 4, 1871.

BY RAILROAD—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	1,131	12
" Port Carbon	373	08
" Schuylkill Haven	4,487	03
" Pine Grove	1,904	08
" Tamaqua	17,404	09
" Harrisburg	14	02
" Dauphin	3,289	11
Total	28,604	14

SHIPPED WESTWARD VIA NORTHERN CENTRAL RAILROAD.

Passing Locust Gap	3,053	14
" Shamokin	6,705	08
" Herndon		
Total	9,759	02

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	838	02
" Lebnaon & Pine Grove Branch	232	12
Total	1,070	14

CONSUMED ON LATERALS.

From Frackville Scales		
" Mill Creek "	134	01
" Schuylkill Valley Scales	406	11
" Mt. Carbon "	546	07
" Cressona "	155	13
" Pine Grove "	11	14
" Tamaqua "	213	19
" Shamokin "		
" Trevorton "		
Total	1,468	05

LEHIGH AND WYOMING COAL.

Received via Allentown, L. Penn'a Br.		
" " Alburtis, "		
" " Plymouth R. R., L. & N. Br.	27	16
" " Connecting R. R. "		
" " Willow Street R. R.		
Total	27	16

BITUMINOUS.

From Harrisburg	8,201	08
" Connecting R. R., G. & N. Br.		
" Junction R. R.	31	01
Total	8,232	09

COAL FOR COMPANY'S USE.

Anthracite	2,201	04
Bituminous	608	15
Total	2,809	19

RECAPITULATION.

	Total for Week.	Corresponding week last Year.	Increase.
Passing over Main Line and Leb. Val. Branch	28,604 14	19,404 06	9,200 10
For Shipment by Canal	—	2,062 10	
Shipped Westward via Northern Central R. R.	9,759 02	2,453 03	7,305 19
Shipped West or South from Pine Grove	1,070 14	285 07	785 07
Consumed on Laterals	1,468 05	3,064 06	
Lehigh and Wyoming Coal	27 16	234 02	
Total Anthracite paying tr'gt	40,930 11	27,503 12	13,426 19
Bituminous	8,232 09	6,124 07	2,108 02
Total of all kinds paying fr'gt	49,163 00	33,627 19	15,535 01
Coal for Company's use	2,809 19	961 07	1,848 12
Total Tonnage for Week	51,972 19	34,589 06	17,383 13
Since Dec. 1, 1870	673,091 01	741,176 19	
Total to date	725,064 00	775,766 05	

SHIPPED BY CANAL.

	Total for Week.	Corresponding week last Year.	Increase.
From Schuylkill Haven	—	—	—
" Port Clinton	—	—	—
Total Tonnage per Week	—	—	—
Since Dec. 1, 1870	—	—	—
Total to date	36,225 17	34,373 16	1,852 01

Philadelphia and Reading R. R.

Amount of coal transported on the Philadelphia and Reading Railrodad, Saturday, March 4, 1871.

From St. Clair	
" Port Carbon	1,131 12
" Pottsville	373 08
" Schuylkill Haven	4.487 03
" Auburn	2,987 08
" Port Clinton	17,317 15
" Allentown and Alburtis	
" Harrisburg and Dauphin	11,505 05
Total paying freight	37,802 11
Coal for Company's use	2,896 12
Total for week	40,699 03
Previously this year	550,556 06
Total	591,255 09
To same time last year	664,546 09

Report of Coal forwarded by Pa. & N. Y. R. R. Co., for week ending March 4, 1871.

	BITUMINOUS. Tons.	Cwt.	ANTHRACITE. Tons.	Cwt.
By Rail	4,186	..	324	18
Previously this year	47,542	10	34,219	09
Total by Rail	....	..	....	..
By Canal	....	..	....	..
Previously this year	....	..	....	..
Total by Canal	....	..	....	..
Total for the year	51,728	10	34,544	07
To the same time last year	38,830	..	56,937	10
Increase	12,898	10	22,393	03

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending March 4, 1871—Compared with same time last year.

WHERE SHIPPED FROM	WEEK 1871., tons ct.	WEEK 1870. tons ct.	YEAR, 1871 tons cwt.	YEAR 1870. tons cwt.
Wyoming Region	7560 15	14553 02	50337 10	115495 10
Upper Lehigh Region		607 12	4814 09	6324 09
Mahanoy Region	40 06	313 02	784 08	1385 08
Hazleton Region				
Beaver Meadow Region			1043 03	
Trescow Region			17360 01	
Mauch Chunk Region	836 13	122 05		30069 02
Totals	8437 14	15596 01	74139 08	153274 18
Increase				
Decrease	7158 07		79133 10	
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	6216 11	10422 15	65882 05	141302 06
Forwarded East of Mch Chunk by Canal				
Delivered at and above Mauch Chunk	2221 03	1557 10	8257 03	6544 18
Delivered to L. & B. R. R. at Plymouth Bridge		3615 16		5427 14
L. V. R. R. at Sugar N.				
Totals	8437 14	15596 01	74139 08	153274 18
Of the above there was transported on acc'nt of L. C. & N. Co.	836 13	627 14	18896 08	37147 01
W.-B. C. & I. Co.	3935 12	2678 00	35876 04	46006 07
Totals	4772 05	3305 14	54472 12	83155 08
Increase	1566 11			
Decrease			29682 16	

Delaware and Hudson Canal Company.

The following is a statement of Coal transported by the Delaware and Hudson Canal Co., for the week ending March 4, 1871.

	WEEK.	SEASON.
By Del. and Hud. Canal		
By Railroad East	suspension.	48,332 00
" West		12,721 00
" South		
TOTAL TONS,		61,053 00
For the same period last year.		
By Del. and Hud. Canal		
By Railroad East	6,198 00	85,050 00
" West	2,457 00	17,165 00
" South	4,520 00	24,536 00
TOTAL TONS,	13,175 00	126,751 00

Pennsylvania Coal Company,

Shipments of Pittston Coal for the week ending March 4, 1871.

	1871. WEEK.	1871. YEAR.	1870. WEEK.	1870. YEAR.
By Railway	— —	2,760 14	19,920 18	154,895 16
" Canal	— —	— —	— —	—
Total	— —	2,760 14	19,920 18	154,895 16

Decrease 132,214 04 tons.

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK, March 11. R. A.	W. A.	AT PHILADELPHIA, March 10. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$— —	— —	— —
Steamer	— —	— —	— —	— —
Broken	— —	— —	— —	— to —
Egg	— to —	— to —	— —	— to —
Stove	— to —	— —	— —	— to —
Chestnut	— to —	— —	— —	— to —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	— —	— —	— —	— —
Broken	— —	— —	— —	— —
Egg	— —	— —	— —	— —
Stove	— —	— —	— —	— —
Chestnut	— —	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A. 8 00		— —	— —
New England	— —		— —	— —
Locust Dale	W. A.	7 50	— —	— —
Honey Brook, Leh'h	W.A.	10 00 to 12 00	— —	— —
Spring Mountain	"	10 00 to 12 00	— —	— —
Sugar Creek	"	10 00 to 12 00	— —	— —
Sugar Loaf	"	10 00 to 12 00	— —	— —
Old Comp'y's	"	10 00 to 12 00	— —	— —
Cross Creek	"	10 00 to 12 00	— —	— —
Room Run	"	"	— —	— —
Girardville	"	"	— —	4 75
McMichael	"	"	— —	4 75
Shamokin	"	"	7 50	5 25 — —
Lykens Valley	"	"	— —	5 75 — —
Broad Top	"	"	7 50	— —
Hill & Harris	"	"	— —	4 75 — —
Henry Clay	"	"	— —	5 00 — —
Powelton	"	"	7 50	— — 4 75

[*Dealers in these coals may be found in our advertising columns.]

Company Coals.

March, 1871.

No quotations during strike.

	L.	Str.	Gra.	Eg.	Sto.	Ches
Scranton at E. Port	— —	— —	— —	— —	— —	— —
Pittston at Weehawken	— —	— —	— —	— —	— —	— —
Lackawana at do	— —	— —	— —	— —	— —	— —
Wilk'b're at Hoboken	— —	— —	— —	— —	— —	— —
Old Co. Lehigh at Pt. Johnston	— —	— —	— —	— —	— —	— —
Lehigh at E. Port	— —	— —	— —	— —	— —	— —

For freights to different points, see "Freights."

Prices for Coal at Mauch Chunk.

March 1871.

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein...f.o.b. at Phila.	$ —
" Lemon " "	—
Cumberland Vein Coal	—
Consolidation Coal Co.'s on board N. Y.	—
Maryland Coal Co. "	—

Prices at Baltimore—March, 1871.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$— —@— —
Pittston and Plymouth, do	— —@— —
Shamokin Red or White Ash, do	— —@— —
Lykens Valley Red Ash, do	— —@— —
Zerba Valley	— —@— —
Treverton	— —@— —
By retail, all kinds per ton of 2240 lbs	— —@— —
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	4 60@4 75
Fairmount and Clarksburg gas, f. o. b. at L. Point	6 00@6 50

Prices at Georget'n, D.C., & Alexandria, Va.

March, 1871.

George's Creek and Cumberland f. o. b. for shipping $4 75

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —@— —
Lykens Valley	— —@— —
Shamokin Red or White Ash	— —@— —
Treverton and Zerba Valley	— —@— —

Prices of Gas Coals.

March, 1871.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N.Y.

	Duty, $1 25, gold Coarse	Slack.
Block House	$1 75 @ 75	
Gowrie	1 75 @ 75	

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25 @1 25	
Sydney	2 25 @— 80	
Lingan	1 60 @— 80	
Little Glace Bay	1 60 @1 00	
Caledonia	1 60 @— 80	

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Currency.
Westmoreland	7 10 @7 25
Fairmount Gas Coal Co. of N. Y.	7 50 @— —
Despard Coal Co.	$7 50 @— —
Penn.	7 75 @8 00
Newburg Orrel Gas	— — @— —
West Fairmount Gs Coal	8 00 @— —

AT PHILADELPHIA.

Powelton	$7 50

Prices of Foreign Coals.

March, 1871.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street New York.

Liverpool Gas Caking	$ 9 00@— —
" " Cannel	11 50@12 50
" House	— —@16 00
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel "	18 00@20 00

Per ton 2,000 lbs. delivered

Foreign and Provincial Freights.

March, 1871.

Closed for the winter.

Foreign.	
Newcastle and Ports on Tyne, per keel of 21 1-5 tons	£14 00@£16 00
Liverpool, 5 per cent primage	13s @16. ton
TO NEW YORK.	
Provincial	
Sidney	$ —
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—
TO BOSTON.	
Sydney	$ —
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

Rates of Transportation to Tide Water.

Closed for the Season.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Port Carbon	$4 00

Less drawback of 50 cents on all Coal shipped east of New Brunswick and south of Cape Henry.

MAUCH CHUNK TO ELIZABETHPORT.	
L. V. Railroad from Mauch Chunk to Easton	$1 84
C. R. R., N. J., Easton to Elizabethport	2 69
Shipping expenses at Elizabethport	25
Warfage	10
Total	$4 88
MAUCH CHUNK TO PORT JOHNSON.	
L. V. R. R., or L. & S. R. R. from M. C. to Easton	$1 84
C. R. R., of N. J., Easton to Pt. Johnson	2 72
Shipping expenses	25
Warfage	10
Total	$4 91
TO HOBOKEN.	
L. V. R. R., Mauch Chunk to Easton	$ —
Morris & Essex R. R. Easton to Hoboken	—
Shipping expenses	—
Warfage	—
Total	$ —
TO SOUTH AMBOY.	
L. V. R. R.	—
R. & D. R. R.	—
Cam. & Am. R. R.	—
Shipping Expenses,	—
Total	$ —
PENN HAVEN TO ELIZABETHPORT.	
L. V. RR. Penn Haven to Easton	—
C. RR. of N. J. Easton to Elizabethport	—
Shipping expenses	—
Wharfage	—
Total	$ —

Freights.—March, 1871.

TO EASTERN PORTS.	From Philadelphia.	From E. Port and Port Johnston.	From Newburg.	From Rondout.
Amesbury	$2 50	$2 00		
Bangor	2 30	1 60		
Bath	2 70	1 85		
Boston	1 75	1 00		
Bridgeport	2 00	1 40		
Bristol	2 75	2 00		
Cambridgeport	2 00	1 20		
Derby	2 30	—		
Dighton	2 35	2 00		
East Cambridge	2 00	1 40		
Fall River	1 75	1 00		
Hackensack	2 50	1 50		
Hartford	1 40	60		
Jersey City	2 25	1 25		
Middletown	—	1 25		
Mystic	2 00	1 40		
New Bedford	2 65	1 85		
Newburyport	1 90	1 00		
New Haven	1 76	1 25		
New London	2 00	1 40		
Newport	1 35	60		
New York	1 80	1 00		
Norwalk	2 00	1 30		
Norwich	2 30	1 50		
Pawtucket	2 30	1 50		
Portland	1 45	1 85		
Portsmouth, N. H.	2 00	1 25		
Providence	2 10	1 65		
Rockport	2 25	1 75		
Saco	1 70	1 20		
Sag Harbor	2 35	1 65		
Salem	2 00	1 00		
Stamford	2 00	1 30		
Stonington	2 30	1 75		
Taunton	—	1 40		
Warren	1 25			
Washington				
TO RIVER PORTS.				
Albany				
Catskill				
Cocksackie				
Coeyman's				
Cold Spring				
Fishkill				
Haverstraw				
Hudson				
New York				
Nyack				
Poughkeepsie				
Rhinebeck				
Rondout				
Saugerties				
Sing Sing				
Stuyvesant				
Tarrytown				
Troy				
West Point				
Yonkers				

METALS.

NEW YORK, March 11, 1871.

IRON.—Duty: Bars, 1 to 1½ cents ₱ lb; Railroad, 70 cents ₱ 100 lbs.; Boiler and Plate, 1¼ cents ₱ lb; Sheet, Hand, Hoop, and Scroll, 1¾ to 1¾ cents ₱ lb: Pig, 7 ₱ ton; Polished Sheet, 3cents ₱ lb; Galvanized 2½; Scrap Cast, $6; Wrought, 8 per ton.

	Store Prices.
Pig, Scotch No. 1, ₱ ton	31 00@34 00
Pig, American, No. 1	34 00@35 00
Pig, American, No. 2	32 00@33 00
Pig, American, Forge	31 00@32 00
Bar Refined, English and American	— —@75 00
Bar Swedes, assorted sizes (gold)	85 00@100 00

	Store Prices, Cash.
Bar, Swedes, ord'y sizes, less 5 ₱ ct.	— —@110 00
Bar, Refined " "	75 00@ 80—
Bar, Common " "	70 00@ — —
Scroll " "	97 50@125 —
Ovals and half-round " "	97 50@125 —
Band " "	92 50@ 95 00
Horse Shoe " "	95 —@ — —
Rods, ⅜ to 3-16 inch " "	82 50@ — —
Hoop " "	102 50@140 00
Nail rod	— —@6¾ —
Sheet, Russia, as to Nos. (gold)	10¾@—11
Sheet, Single, D. and T. Common	4½@— 6
Sheet, Galv'd, Nos. 14 to 26 10 and 12c. Nos. 27, 28, and 29, 13@14	
Rails, English (gold), ₱ ton	56 00 @58 00
Rails, American, at Works in Pa	54 50 @59 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ₱ lb or under, 2¼ cents; over 7 cents and not above 11, 3 cents ₱ lb; over 11 cents, 3½ cents ₱ lb, and 10 ₱ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ₱ lb	— 15	@—	18
English Spring (2d and 1st quality)	— 7	@—	10
English Blister (2d and 1st quality)	— 10	@—	17
English Machinery	— 11½	@—	14
English German (2d and 1st quality)	— 13	@—	15
American Blister "Black Diamond"	— —	@—	12
American, Cast, Tool do.	— 16	@—	17
American, Spring, do.	— 9	@—	11
American Machinery, do.	— —	@—	12
American German, do.	— 9	@—	12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ₱ lb; Manufactured, 45 per cent. ad val.

	All Cash.		
Copper, New Sheathing, ₱ lb	—	@—	30
Copper Bolts	—	@—	32
Copper Braziers, 16oz. and over	—	@—	32
Copper Nails	—	@—	37
Copper, Old Sheathing, &c., clean	19	@—	20
Copper, Chili Pig	—	@—	
Copper, American Ingot	21¼	@—	21¾
Yellow Metal, New Sheating	—	@—	22
Yellow Metal Bolts	24	@—	
Yellow Metal Nails	—	@—	22

LEAD.—Duty: Pig, $2 ₱ 100 lbs.; old Lead, 1¼ cents ₱ lb: Pipe and Sheet, 2¾ cents ₱ lb.

Galena, ₱ 100 lbs	—	@—	—
Spanish (gold)	6 20	@6	25
German, do.	6 20	@6	25
English, do.	6 20	@6	50
Bar (net)	— —	@8	75
Pipe (net)	— —	@10	25
Sheet	— —	@10	25

Colwell, Shaw & Willard Tin-Lined Pipe 15 cts. ₱ lb.

TIN.—Duty: Pig, Bars, and Blocks, 15 ₱ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₱ cent.; Roofing 25. ad val.

	Gold ₱ lb.	
Banca	38½	@—
Straits	32½	@33
English	—	@32¼

PLATES. Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ₱ box	$8 62½@9 00	$10 00 @10 50
I. C. Coke	7 37½@7 75	8 37½@ 8 75
Coke Terne	6 25 @7 25	7 00 @ 8 00
Charcoal Terne	7 75 @8 25	8 75 @ 9 50

REMARKS.

IRON.—There continues quite an active demand for Scotch Pig, but the stock is somewhat reduced, and business has been in a measure restricted, the advance noted in our tables, however, is fully maintained—250 tons Glengarnock sold at $33, 200 do. Garthsherrie, $32, and 500 do. Coltness, Eglinton and Glengarnock, on private terms. The market for American remains quiet, there being no disposition on the part of the holders to operate, and prices still have an upward tendency—we quote No. 1 $34 @ $35, and No. 2 $32 @ $33. Wrought Scrap continues in request, and we notice sales of 6 @ 700 from yard at about $89. Rails remain quiet but steady at $55 @ $57, gold, for English, and $70 @ $72, currency, for American at the works in Pennsylvania. Refined Bar from store is stronger, and an advance is confidently looked for within a few days.

COPPER.—The manufactures of Copper and Yellow Metal are steady at our quotations. Ingot is dull and irregular. The bulk of the stock is in speculative hands, and not offered at present quotations, but the limited demand is supplied by holders of outside parcels at prices rather in buyers' favor. The sales embrace about 200,000 lb. Lake at 21½ to 21¾ cents. Baltimore and Tennessee is held at the same price as Lake.

TIN.—Pig is still neglected, and prices are in a great measure nominal. We quote Straits 32¾a33 cents, English 32¾, and Banca 38½, all gold. Plates are in fair demand at the prices previously ruling. Sales have been made of 1250 bxs. Charcoal Tin at $8 62½a$8 75 for I. C., part short time; 250 do. Charcoal Terne, $7 75a$7 87½, gold; 500 do., 300 do. Coke Terne. and 500 do. Coke Tin, on terms not made public.

LEAD.—The demand for Pig is very limited, and we hear of no sales. We quote ordinary Foreign $6 20, gold; Bar 8¾c., and Sheet and Pipe 10¼c., cash, less 10 per cent. to the trade.

STEEL.—Business is only moderate, and stocks are good.

SPELTER.—The business is limited, and we have only to notice the sale of 30 tons Silesian at 6c., gold.

ZINC AND ZINC PAINT.—Spelter, foreign Silesian, 6c. gold; Zinc Sheet, foreign, 9c.; Zinc, white, 10c.; American, 7c.; Manganese, high test, 5c.

San Francisco Stock Market.

A telegram from San Francisco March 9, quotes mining stocks as follows:—

Savage	41⅛
Yellow Jacket	48
Kentuck	47⅛
Chollar Potosi	79
Gould & Curry	no sale
Belcher	24¼
Imperial	15
Amador	no sale
Crown Point	—
Hale & Norcross	—

The Slate Trade.

[Corrected weekly.]

(A "square" represents 100 superficial feet.)

PRICES OF ROOFING SLATE.

Vermont purple, 1st quality, per square	$6 50@	7 00
" green, 1st " "	6 50@	7 00
" red, 1st " "	15 00@16 00
" variegated, " "	5 75@	6 20
d. b'k and d'k blue, 1st qual., "	6 00@	7 05

How the Excavations are conducted at Pompeii

An "excavation pic-nic" took place at Pompei last month, in honor of the arrival of Professor Pierce and the other members of the American Eclipse Expedition. A correspondent of the Boston *Advertiser* describes the scene: "On arriving at Pompeii the party were first conducted to the present limit of the excavations, that they might witness the entire process of the labor. The wheelbarrow is still unkown to the Italian laborer, and his rude broad pick and his *zappa*, which serves alike for hoe and spade, would be disdained by the meanest of an American's adopted fellow-citizens. Men and women, boys and girls, are employed indifferently, and go scrambling and chattering up the steep bank, with their little basketful of dirt upon head or shoulder. A miniature railway, operated by boy-power, is laid near the edge of the cutting, and as fast as the cars are filled they are pushed away, beyond the lines of the city walls, and beyond the amphitheatre, where their contents are dumped. Close upon the diggers follow another set of workmen. These prop up crooked walls; repair breeches made by tearing down the roof supports and lintels, if these are of such extent as to threaten the crumbling of the partitions; cut out and carry away such mural paintings and tablets as have any unusual value and can be removed in good condition, or roof over and otherwise protect such as must be left in place, but might suffer from exposure.

Just at present the excavators are revealing nothing of any intrinsic value, for the street now opening appears to have been almost exclusively occupied by mining shopkeepers—some of them possibly in the military equipment business, for a portion of a full-length and life-sized painting of a Roman legionary in complete armor has recently been brought to light beside one shop-door. In many other places in the neighborhood are painted up what seems to be the names of candidates for various local offices, so that perhaps this district was the haunt of the ward politicians of an older day. Accordingly, Professor PIERCE's party were warned that they must not anticipate the finding of any treasures, nor even be disappointed if nothing were found, for this is the case with many buildings, everything having been either carried away or destroyed.

The street itself must have been a pretty one, for the buildings throughout nearly its entire length were painted in high alternate panels of red and black, relieved with some light ornament. Doubtless it was also a lively one, for beside all its shops, it boasted a livery stable, in front of whose broad doorway the sidewalk was sloped to the roadway, that the chariots might roll out freely. The more modest art of donkey-riding, too, found its opportunities here, for a great room in the rear of the stable indicates by its frescoes that the proprietor did not content himself alone with "carriage customers."

Two or three of the more promising shops and houses had been reserved by the superintendent for particular attention, and in front of them chairs had been placed for the company. The *debris* had been left, as we have intimated above, to the depth of two or three feet over the floors, and the doorway had been blocked by large stones to keep the looser dust from rolling out into the clean-kept street. A dozen men were immediately set to work, and about as many *custodi* stood by, watching with all the sharpness of their long trained eyes that nothing might be caught up and concealed. Experience has taught the directors in what part of each particular building objects are most likely to be found; and, therefore, while one man was digging away with the utmost *insouciance*, his fellow, close beside him, would be upon his knees carefully scraping away the dirt with his fingers.

The first building was evidently a shop, with a living-room at the back, but there was no external indications of its character. Digging soon developed a great iron furnace or oven, leaden-covered, and set in brick, in the centre of the front room; and the most popular surmise was the owner had been a cook, for a few bronze vessels of the saucepan type were found near the furnace, together with the bones of two or three dogs and cats which imagination figured as having sought the shop after its master's flight, in search of fat pickings, and as having paid for their gluttony more dearly than by a beating.

A couple of wine *amphoræ*, a lamp, a bit of money, a bronze ring, some ivory pallets for the hinges of doors and movables, a door-key, and a few nails, composed the treasure-trove, the back room being absolutely empty. Fragments of the red tiles and some charred bits of the wood-work, which throughout the city was almost all ignited by the blazing cinders of the *dies iræ*—were mingled with the ashes and pumice, as also were a few broken jars and lamps; but all the latter pieces were broken to atoms as fast as found, that nothing recognizable as a bit of Pompeii might go elsewhere than into the museum. The next door neighbor of our shopkeeper had left nothing for posterity but his simple mosaic pavement; perhaps, on the other hand, we thought, his friend had left his trifles behind him in order to take his stone carpet with him, for in his two rooms we found nothing but the base earth for flooring.

The Coal Famine.

If the country be not acquainted with the merits and demerits of the coal imbroglio, it will not be for lack of literary elucidation or perplexity of the subject. The pen brandishes its torchlights above the Vulcanian wrangle, and tries to light up the arena of the combatants; but about all that can plainly be made out is that capital and labor are having one of their periodical strifes. Who began it? who perpetuates it? what its final merits are, are questions which it is not easy to settle to the satisfaction of all concerned. It is an old strife, which breaks out now and then in the coal regions; a sort of fluctuating cutaneous malady, which is occasionally mitigated by the empiricism of compromise; but it manifests itself again on the least provocation, showing that it is constitutional, or that for its eradication constitutional treatment is necessary.

It seems pretty clear that there is no serious difference between the employers and the operatives. The majority of the latter would be glad to accept the terms offered by the former to go to work. But they are restrained by a tyranny which has grown up amongst them, and which lodges in a few irresponsible hands an authority over their action which is practically absolute and despotic. Like Frankenstein, they have built to themselves an image which they can not control, but which, on the contrary, coerces its creators to do its bidding. If it tells them to strike, the picks drop from thirty thousand hands, and hunger invades the cottages and cabins of a principality. They have no means of appeal or remonstrance which they can employ with sufficient celerity and directness to be of any practical service to them, even if they had not a blind and superstitious subservience to the leaders whom they have placed over them. Months and months are wasted each year in compulsory idleness, while capital loses its legitimate profit, the laborer his wages, and the consumer of coal bears his own not inconsiderable share of the burden. It is this anomalous and arbitrary state of things from which the great producing and transporting companies are endeavoring to relieve themselves.

In this it is certain that they have the sympathy of the majority of their workmen, and are only combated by the handful of schemers and conspirators, who, doing no work themselves, supported by the operatives whose interest they injure while pretending to guard them, stand between the workingman and the employer, and do their best to blight the prosperity of each. It is time that a power so uniformly injurious in its effects should be extinguished; that the workman should demand in return hit surrendered freedom of action, and that the employer should enforce his right so to manage his business as to keep out of bankruptcy—a direction in which the coal-producing business of Pennsylvania has been, owing to the cause we have mentioned, steadily drifting for the last year or two. Hardly a colliery in Pennsylvania last year paid mining expenses. In Schuylkill county alone, the loss of the operators during the twelve months is computed at two and half millions of dollars.

Intelligent and candid men, thoroughly familiar with the subject, attribute this loss solely to the arbitrary course of the Miners' and Laborers' Benevolent Association, to the protracted strikes which they compelled, and the high prices upon which they insisted. It is probable that other causes may have co-operated with this. It is known that the producing capacity of the Pennsylvania coal fields, and the transporting capacity of the several lines of railroad and canals leading from thence to market, are greatly in excess of any present demand. The producer is therefore occasionally likely to get in the market less for his produce than it costs to deliver it there; but when to this condition, inseparable from the industry, is added the arbitrary and ruinous exactions of the operatives, the prolonged strikes, involving a complete suspension of labor just at the time when labor would be most profitable to the employer, the business becomes one so insecure and precarious as to drive capital and enterprise out of it, and leave the workmen in the condition of the youth who killed the goose that laid him golden eggs.

The wages which the rulers of the Miners' Association have deemed inadequate, and for the increase of which they have ordered strikes, have been much larger than those paid in the vicinity for other sorts of labor, and, indeed, more than equal to the average reward of industry in the various handicrafts throughout the country. The popular clamor against the capitalists will, therefore, be seen to have no basis in reason. They are not archangels, we know, and, unless compelled, they do not often give more for labor or anything else than its market rate; but, in the present case, we do not see that any just censure can be cast upon them. They are opposing a meddlesome and self-constituted cabal, which dominates and awes the industry of an immense region, and which has either got to be overthrown, or it will perpetuate the injuries which it has already so extensively inflicted upon the laborer, the employer, and upon the community, which depends for light and warmth upon the mines, of which it impudently claims the right to arrest the product.—*N. Y. Standard.*

Petroleum as Fuel.

THE question of utilizing crude petroleum for the purposes of fuel, which has attracted the attention of many scientific and practical men ever since the discovery of that article, seems at last to be in a fair way of solution. A series of remarkable experiments have hitherto been tried to utilize the immense heat-producing power of petroleum, and three different plans were tested by the Navy Department in 1867. These, however, all brought petroleum into direct contact with fire, and were therefore fraught with much danger as well as many chemical difficulties.

The great aim, therefore, was to discover a process whereby the tendency to carbonization should be overcome. This difficulty has been done away with.

The apparatus consists of a cylinder, like a small locomotive boiler set on end, with a smaller cylinder within it, the intervening space being filled with petroleum. The smaller cylinder is filled with six hundred small copper tubes, and through these the superheated steam passes, producing vapor from the oil that fills the interstices between the tubes. This vaporized oil rises through a layer of prepared sponge, and just at the point of exit is mixed with superheated steam in any required proportion, thus producing hydrocarbon gas. This gas passes through iron tubes to the point where the fuel is needed, and is there burned, very much like common gas. In the case which was shown, the kiln was filled with stone, and in a very short time after the fire was lighted the heat was more intense than can be expressed by comparison. All this time the fire was under perfect control, and by a simple turn of a screw the combustion was made more or less intense. The experiment was varied by admitting a greater or less proportion of steam into the pipes, so that in some cases the fire was fed with fifty per cent. or more of water, and the remainder of vaporized oil.—*Chicago Evening Mail.*